Test Report

Product Name ： Navigation system

Model No. ： GPSmile 61CS

FCC ID. ： RJI-NAV61CS

Applicant ： Holux Technology, Inc.

Address ： No. 1-1, Innovation Road 1, Science-Based Industrial Park, Hsinchu 300, Taiwan, R.O.C.

Date of Receipt ： 2012/07/24

Issued Date ： 2012/09/14

Report No. ： 127436R-RFUSP43V01

Report Version ： V1.0

Test Report Certification

Issued Date : 2012/09/14
Report No. : 127436R-RFUSP43V01

QuieTek

Product Name	：	Navigation system
Applicant	：	Holux Technology, Inc.
Address	：	No. 1-1, Innovation Road 1, Science-Based Industrial Park, Hsinchu 300, Taiwan, R.O.C.
Manufacturer	：	Holux Technology, Inc.
Model No.	：	GPSmile 61CS
FCC ID.	：	RJI-NAV61CS
EUT Voltage	：	DC 12V (Power by Charger)
Trade Name	：	HOLUX
Applicable Standard	：	FCC CFR Title 47 Part 15 Subpart C Section 15.247: 2011
Test Result	：	Complied

The test results relate only to the samples tested.

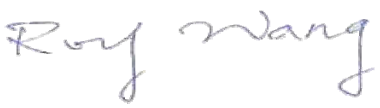
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

Documented By : 

(Carol Tsai / Engineering Adm. Specialist)

Reviewed By : 

(Quale Tang / Engineer)

Approved By : 

(Roy Wang / Manager)

Laboratory Information

We, **QuieTek Corporation**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	**:**	**TAF, Accreditation Number: 1313**
Germany	**:**	**TUV Rheinland, Certificate No.: 10011438-2-2010**
USA	**:**	**FCC, Registration Number: 365520**
Canada	**:**	**IC, Submission No: 150981**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site:http://www.quietek.com/tw/ctg/cts/accreditations.htm

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

HsinChu Testing Laboratory:

No.75-2, 3rd Lin, Wangye Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan, R.O.C.

TEL:+886-3-592-8858 / FAX:+886-3-592-8859 E-Mail : service@quietek.com

LinKou Testing Laboratory:

No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan, R.O.C.

Suzhou Testing Laboratory:

No. 99 Hongye Rd., Suzhou Industrial Park Loufeng Hi-Tech Development Zone., Suzhou,China.

TABLE OF CONTENTS

1. General Information

1.1. EUT Description

Product Name	Navigation system
Trade Name	Holux
Model No.	GPSmile 61CS
Frequency Range	2402~2480MHz
Antenna Gain	2dBi
Channel Number	79
Type of Modulation	GFSK (1Mbps), π/4-DQPSK (2Mbps), 8-DPSK (3Mbps)
Channel Control	Auto
Antenna Type	Chip antenna

Component	
Cradle with power and UART Cable	1Set Uart Cable: Shielded, 0.14m USB Cable: Shielded, 0.14m
Uart Cable	Shielded, 1m
USB Cable	Shielded, 0.5m
Battery	Li-ion, W0003 P/N: 69019-00N Rating: 3.7 1050mAh 3.9Wh
Motorbike Charger	HOLUX TECHNOLOGY, MOTORBIKE CHARGER I/P: DC 12V O/P: 5.3V Cable IN: Non-Shielded, 2m Cable Out: Non-Shielded, 0.3m
Car Charger	LEN CHENG BROTHER, GER-5B-BL I/P: 10.8V-30V O/P: 5V⎓2A Cable out: Non-Shielded, 2.0m

Working Frequency of Each Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00	2402 MHz	Channel 20	2422 MHz	Channel 40	2442 MHz	Channel 60	2462 MHz
Channel 01	2403 MHz	Channel 21	2423 MHz	Channel 41	2443 MHz	Channel 61	2463 MHz
Channel 02	2404 MHz	Channel 22	2424 MHz	Channel 42	2444 MHz	Channel 62	2464 MHz
Channel 03	2405 MHz	Channel 23	2425 MHz	Channel 43	2445 MHz	Channel 63	2465 MHz
Channel 04	2406 MHz	Channel 24	2426 MHz	Channel 44	2446 MHz	Channel 64	2466 MHz
Channel 05	2407 MHz	Channel 25	2427 MHz	Channel 45	2447 MHz	Channel 65	2467 MHz
Channel 06	2408 MHz	Channel 26	2428 MHz	Channel 46	2448 MHz	Channel 66	2468 MHz
Channel 07	2409 MHz	Channel 27	2429 MHz	Channel 47	2449 MHz	Channel 67	2469 MHz
Channel 08	2410 MHz	Channel 28	2430 MHz	Channel 48	2450 MHz	Channel 68	2470 MHz
Channel 09	2411 MHz	Channel 29	2431 MHz	Channel 49	2451 MHz	Channel 69	2471 MHz
Channel 10	2412 MHz	Channel 30	2432 MHz	Channel 50	2452 MHz	Channel 70	2472 MHz
Channel 11	2413 MHz	Channel 31	2433 MHz	Channel 51	2453 MHz	Channel 71	2473 MHz
Channel 12	2414 MHz	Channel 32	2434 MHz	Channel 52	2454 MHz	Channel 72	2474 MHz
Channel 13	2415 MHz	Channel 33	2435 MHz	Channel 53	2455 MHz	Channel 73	2475 MHz
Channel 14	2416 MHz	Channel 34	2436 MHz	Channel 54	2456 MHz	Channel 74	2476 MHz
Channel 15	2417 MHz	Channel 35	2437 MHz	Channel 55	2457 MHz	Channel 75	2477 MHz
Channel 16	2418 MHz	Channel 36	2438 MHz	Channel 56	2458 MHz	Channel 76	2478 MHz
Channel 17	2419 MHz	Channel 37	2439 MHz	Channel 57	2459 MHz	Channel 77	2479 MHz
Channel 18	2420 MHz	Channel 38	2440 MHz	Channel 58	2460 MHz	Channel 78	2480 MHz
Channel 19	2421 MHz	Channel 39	2441 MHz	Channel 59	2461 MHz		

1.2. Operational Description

The GPSmile 61CS is a GPS navigation system with Bluetooth function. The baseband Bluetooth signal is generated digitally and modulated in accordance with GFSK modulation scheme employed in Bluetooth. The Bluetooth technology operates in the unlicensed industrial, scientific and medical (ISM) band at 2402MHz to 2480MHz.

This device is using a spread spectrum and frequency hopping and the signal hops among 79 frequencies at 1 MHz intervals to give a high degree of interference immunity. The Bluetooth Module, nF-2303 was used CSR BC05 Multimedia chip. The working voltage of this device is 3.3Vdc. The type of antenna is 2dBi chip antenna without antenna connector.

1.3. Test Mode

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Pre-Test Mode	
EMI	Mode 1: Transmit
Final Test Mode	
EMI	Mode 1: Transmit

Emission	Mode 1
Conducted Emission	No
Peak Power Output	Yes
Radiated Emission	Yes
RF antenna conducted test	Yes
Band Edge	Yes
Number of hopping Frequency	Yes
Carrier Frequency Separation	Yes
Occupied Bandwidth	Yes
Dwell Time	Yes

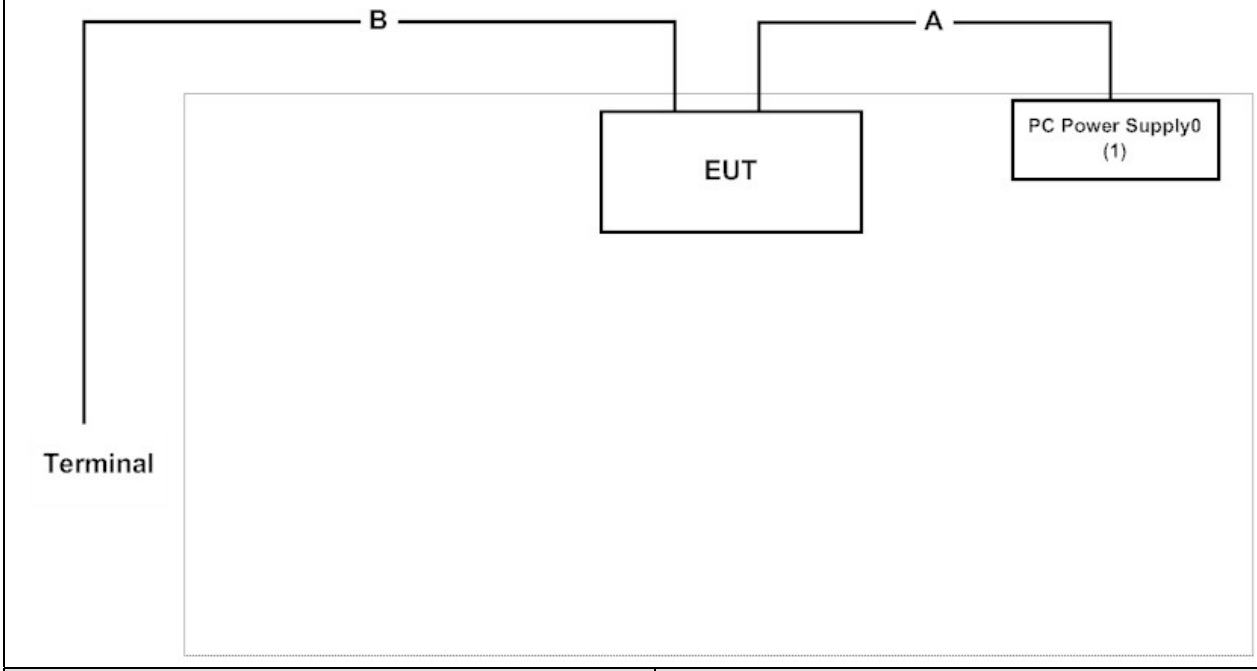
1.4. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1	PC Power Supply	Agilent	E3645A OEM	MY50030024	DoC	Non-Shielded, 1.5m

1.5. Configuration of tested System

Connection Diagram



Signal Cable Type		Signal cable Description
A	Power Cable	Non-Shielded, 2.4m
B	Uart Cable	Shielded, 1m

1.6. EUT Exercise Software

1	Setup the EUT and Notebook PC as shown on 1.5.
2	Execute the BlueSuite V2.0 which is installed on the Notebook
3	Configure the test mode, the test channel.
4	Press “TXDATA1” to start the continuous Transmitter.
5	Verify that the EUT works properly.

1.7. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
Temperature (°C)	FCC PART 15 C 15.247 Peak Power Output (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	46
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Radiated Emission (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	54
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 RF antenna conducted test	15 - 35	25
Humidity (%RH)		25 - 75	46
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Band Edge (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Number of hopping Frequency (FHSS)	15 - 35	26
Humidity (%RH)		25 - 75	46
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Carrier Frequency Separation (FHSS)	15 - 35	26
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Occupied Bandwidth (FHSS)	15 - 35	26
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Dwell Time (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	46
Barometric pressure (mbar)		860 - 1060	950-1000

2. Peak Power Output

2.1. Test Equipment

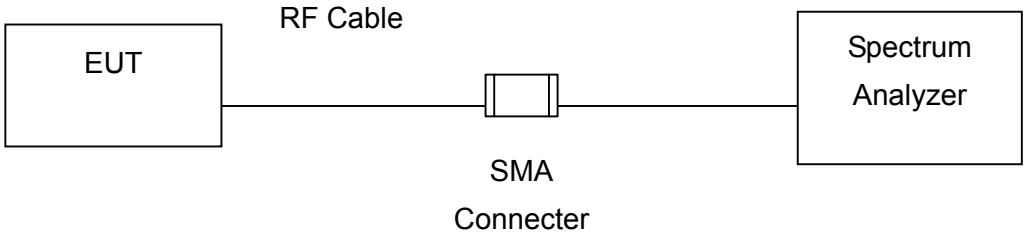
The following test equipment is used during the test:

Peak Power Output / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.2. Test Setup



2.3. Test procedures

The EUT was setup according to ANSI C63.4, 2009 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements

2.4. Limits

For frequency hopping systems operating in the 902-928 MHz band: 1 Watt for systems employing at least 50 hopping channels; and, 0.25 Watts for systems employing less than 50 hopping channels.

For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1Watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watt.

2.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2011

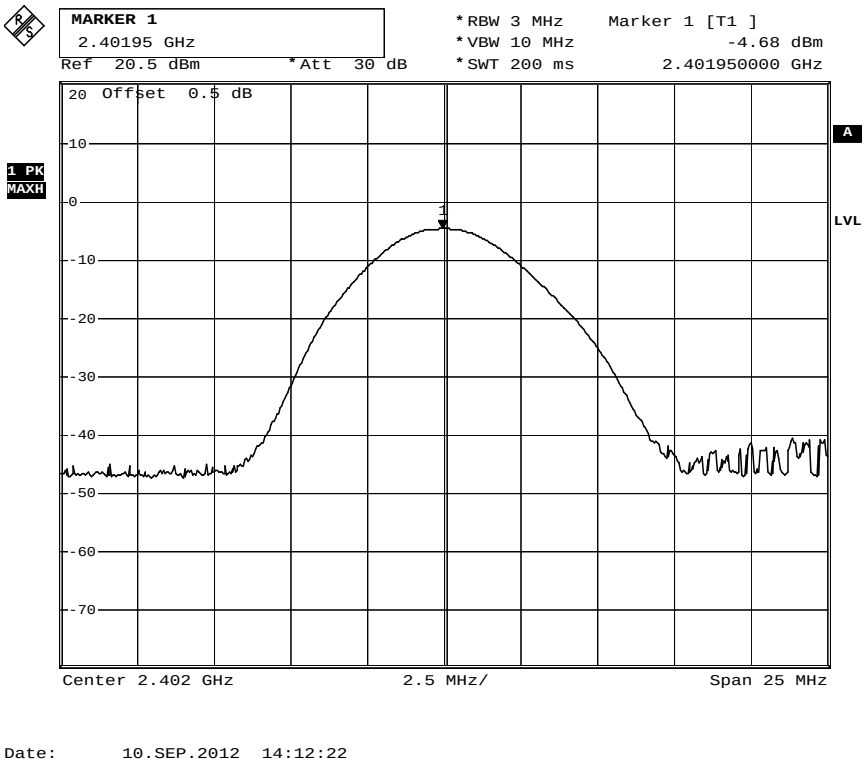
2.6. Test Result

Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-4.680	30	Pass

Channel 00

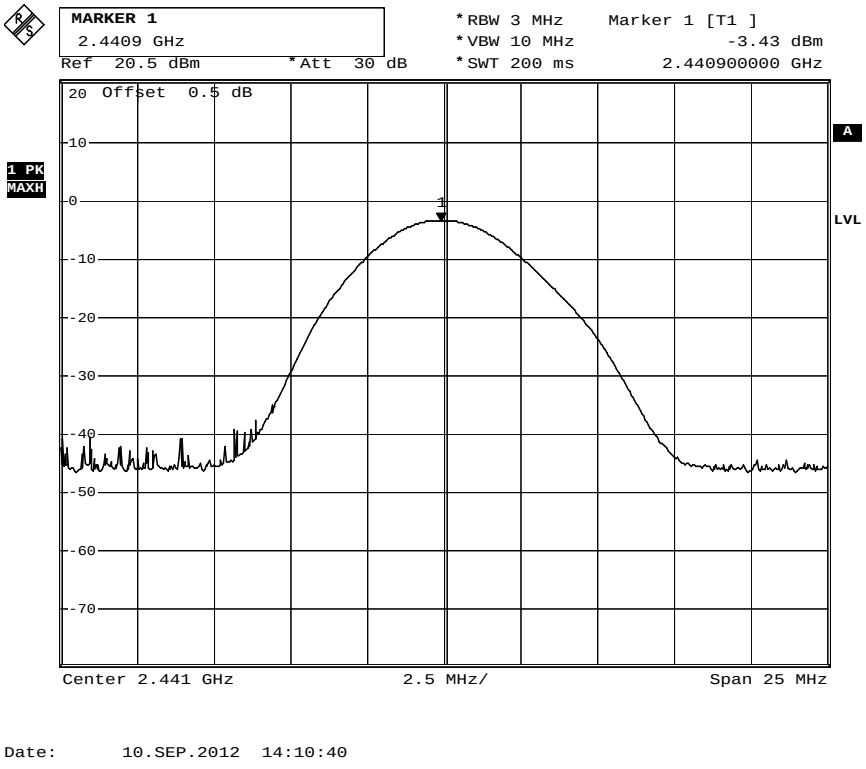


Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
39	2441	-3.430	30	Pass

Channel 39

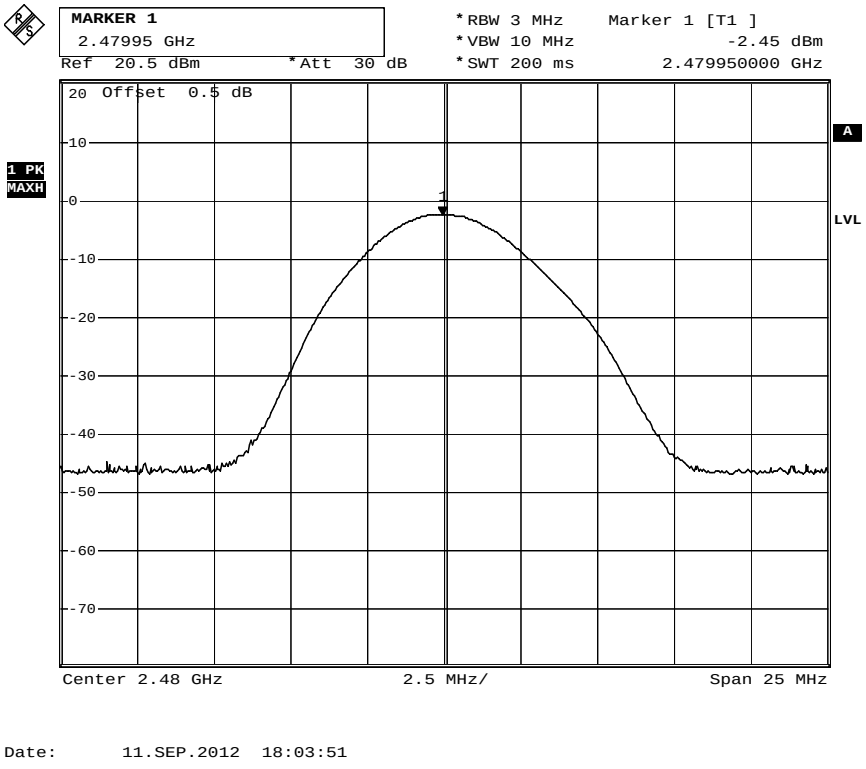


Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
78	2480	-2.45	30	Pass

Channel 78

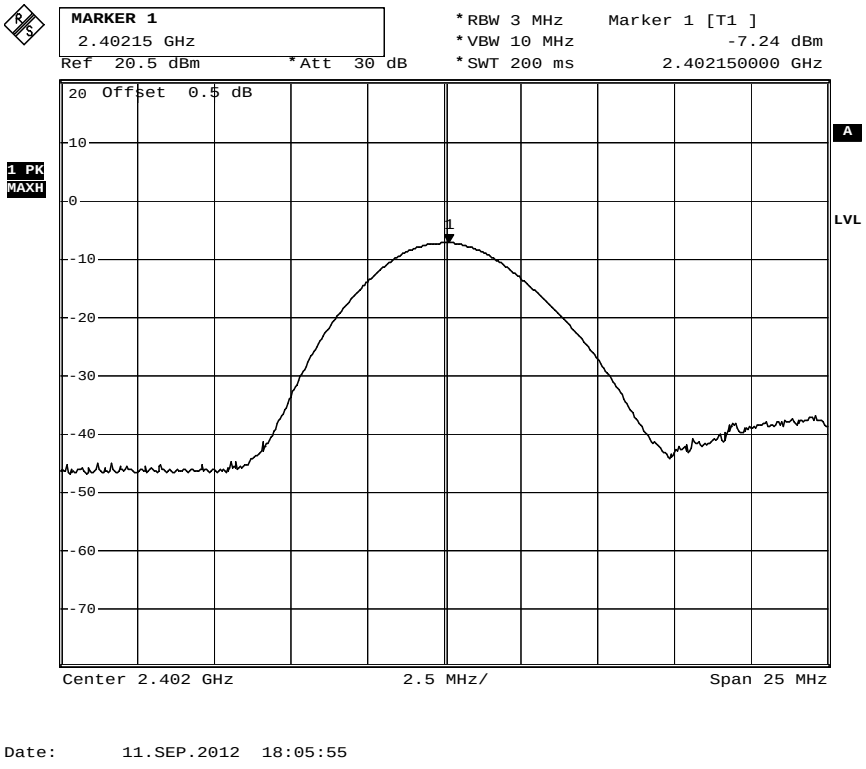


Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-7.24	30	Pass

Channel 00

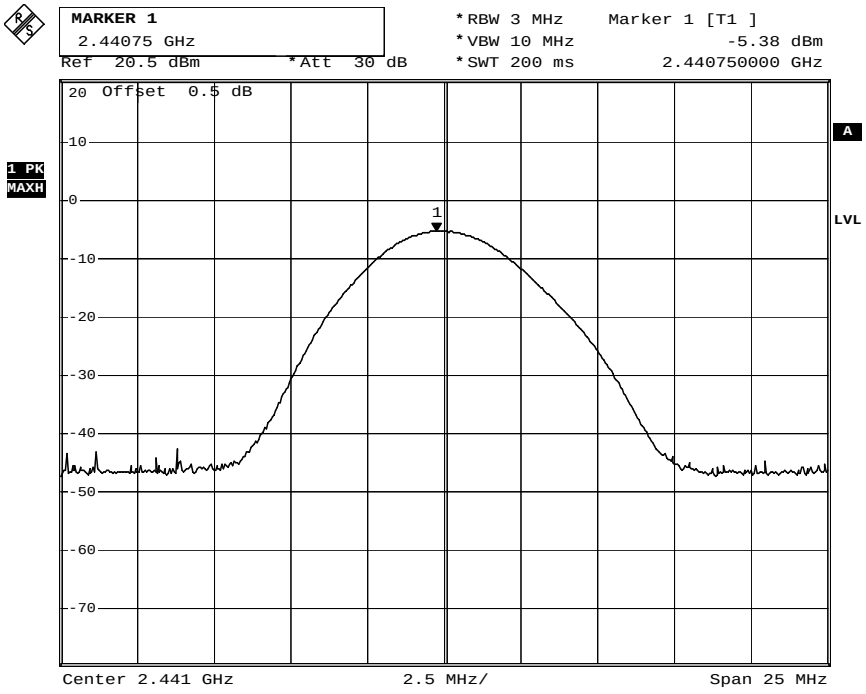


Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
39	2441	-5.380	30	Pass

Channel 39



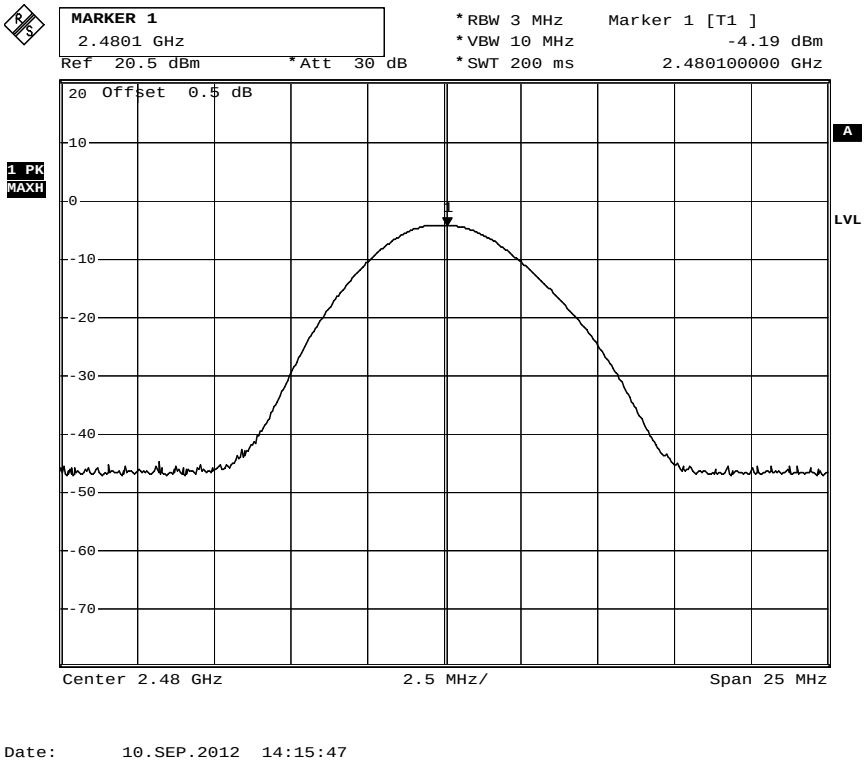
Date: 10.SEP.2012 14:17:22

Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
78	2480	-4.190	30	Pass

Channel 78

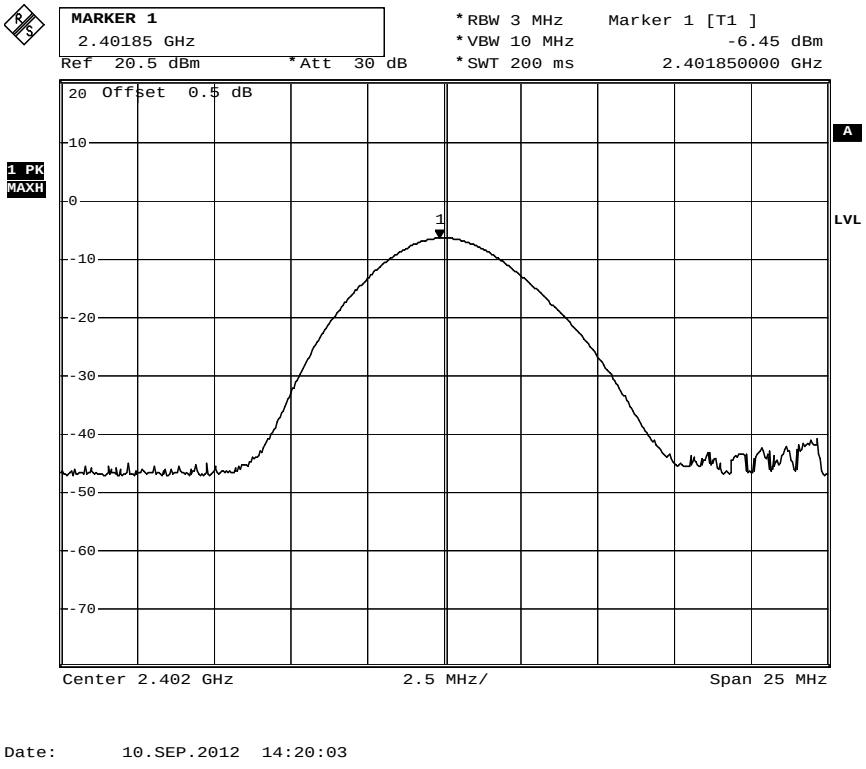


Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-6.450	30	Pass

Channel 00

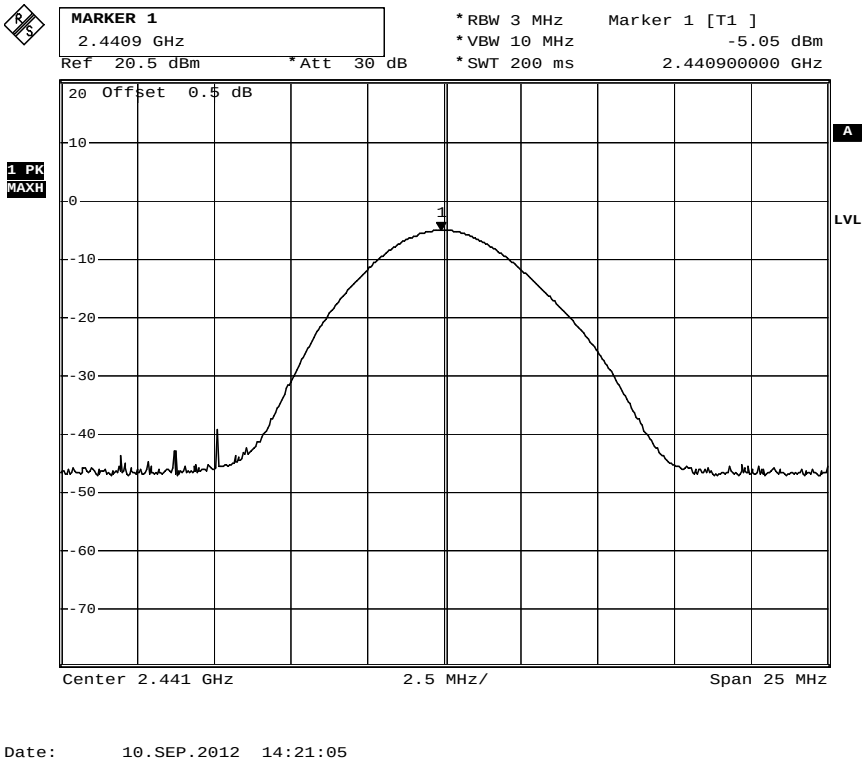


Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
39	2441	-5.050	30	Pass

Channel 39

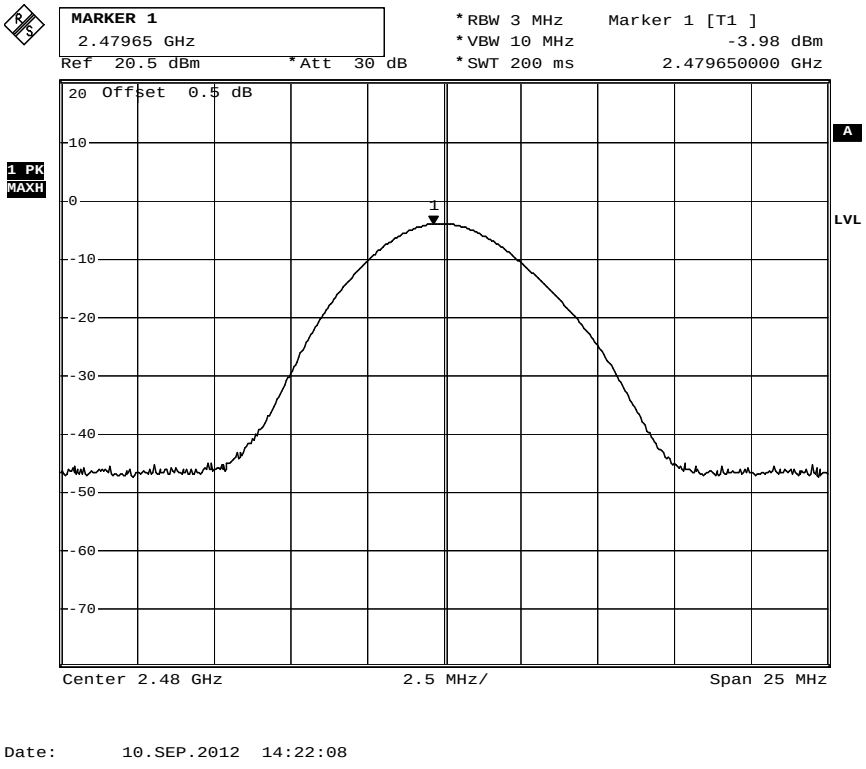


Product	Navigation system		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
78	2480	-3.980	30	Pass

Channel 78



3. Radiated Emission

3.1. Test Equipment

The following test equipments are used during the test:

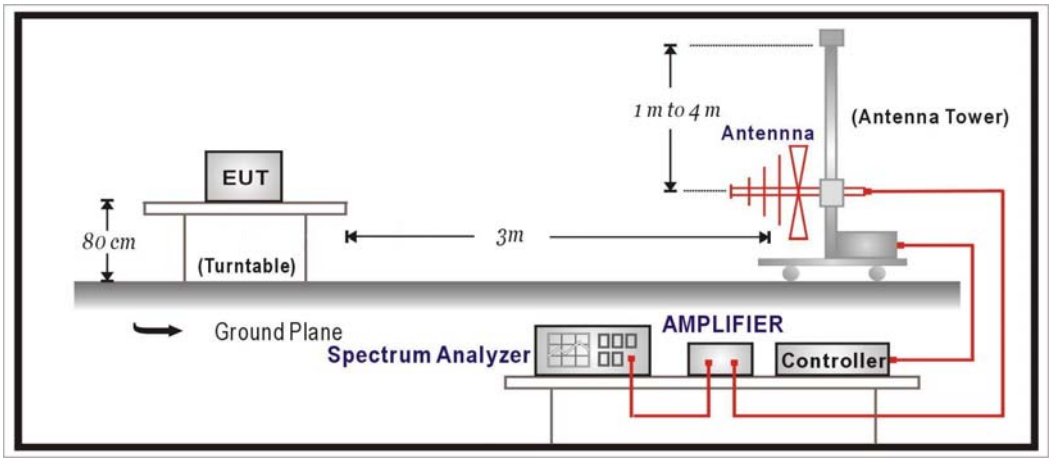
Radiated Emission / CB1

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	SCHAFFNER	CBL6112B	2895	2013/08/14
Double Ridged Guide Horn Antenna	Schwarzback	BBHA 9120D	743	2013/02/02
Pre-Amplifier	MITEQ	AMF-4D-005180-24-10P	888003	2012/12/05
Pre-Amplifier	QuieTek	AP-025C	CHM-0706049	2013/03/01
Spectrum Analyzer	Agilent	E4440A	MY46187335	2013/02/07
Coaxial Cable	Huber+Suhner AG	Sucoflex 102	25623/2	2013/03/04

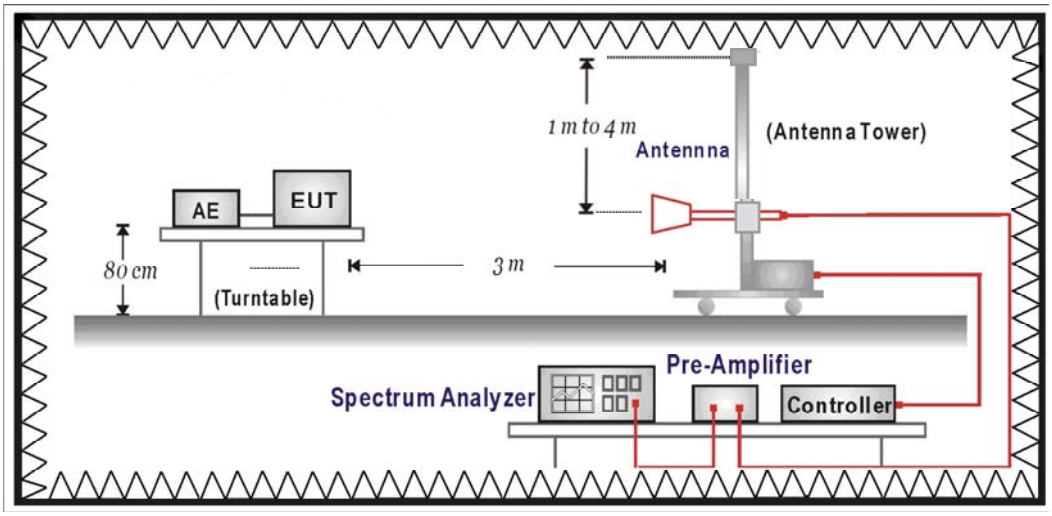
Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

3.2. Test Setup

Under 1GHz Test Setup:



Above 1GHz Test Setup:



3.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m	dBuV/m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks : 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2009 on radiated measurement.

On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit. The bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

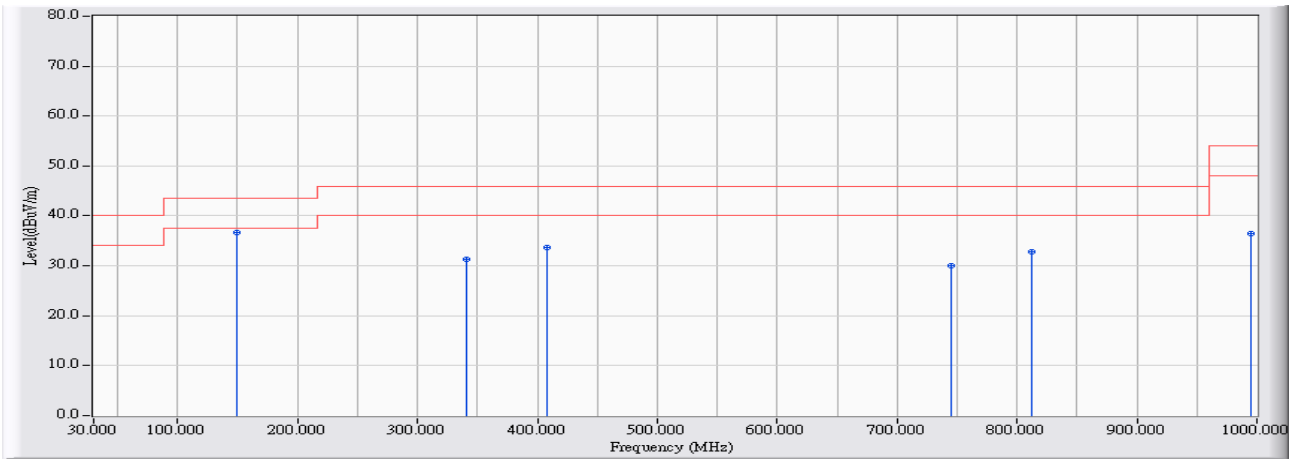
3.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2011

3.6. Test Result

30MHz-1GHz Spurious

Site : CB1	Time : 2012/09/07 - 20:34
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	Power : DC 12V
EUT : Navigation system	Note : 2402MHz

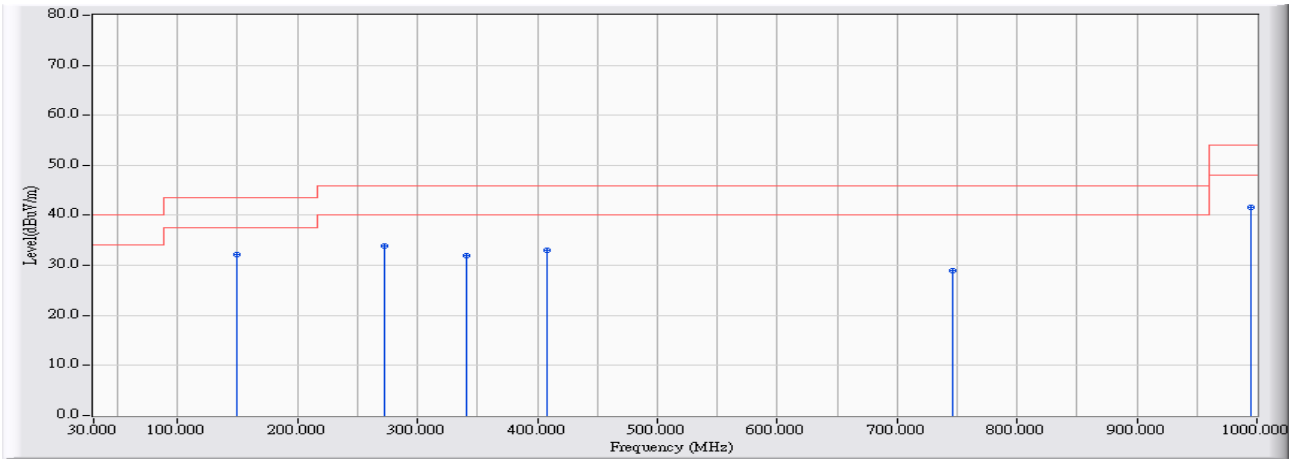


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	149.633	-11.580	48.350	36.770	-6.730	43.500	QUASIPEAK
2		340.400	-12.253	43.669	31.416	-14.584	46.000	QUASIPEAK
3		408.300	-10.929	44.518	33.589	-12.411	46.000	QUASIPEAK
4		744.567	-8.760	38.795	30.035	-15.965	46.000	QUASIPEAK
5		812.467	-8.513	41.245	32.732	-13.268	46.000	QUASIPEAK
6		995.150	-3.972	40.404	36.433	-17.567	54.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	**Time : 2012/09/07 - 20:35**
Limit : FCC_CLASS_B_03M_QP	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

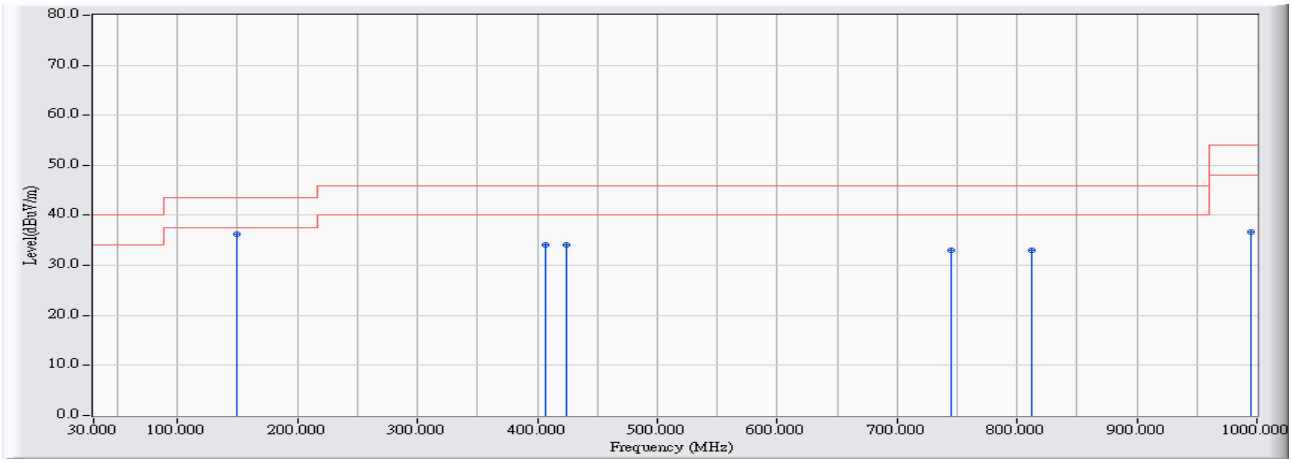


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	149.633	-11.580	43.762	32.182	-11.318	43.500	QUASIPEAK
2		272.500	-14.035	47.901	33.866	-12.134	46.000	QUASIPEAK
3		340.400	-12.253	44.230	31.977	-14.023	46.000	QUASIPEAK
4		408.300	-10.929	43.963	33.034	-12.966	46.000	QUASIPEAK
5		746.183	-8.745	37.665	28.920	-17.080	46.000	QUASIPEAK
6		995.150	-3.972	45.500	41.529	-12.471	54.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	**Time : 2012/09/07 - 20:35**
Limit : FCC_CLASS_B_03M_QP	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2441MHz**

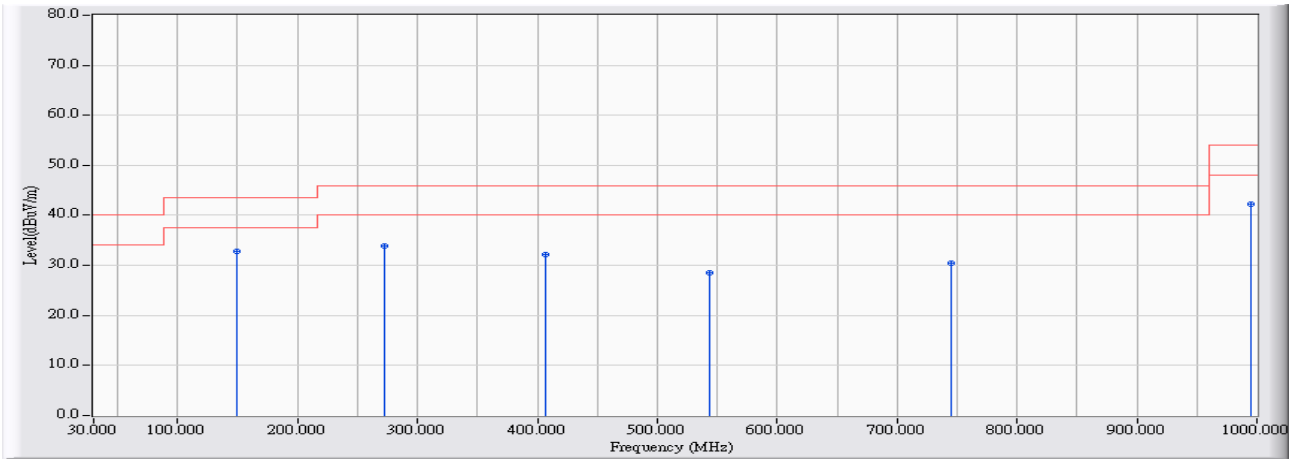


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	149.633	-11.580	47.772	36.192	-7.308	43.500	QUASIPEAK
2		406.683	-10.949	45.065	34.116	-11.884	46.000	QUASIPEAK
3		424.467	-10.717	44.878	34.161	-11.839	46.000	QUASIPEAK
4		744.567	-8.760	41.873	33.113	-12.887	46.000	QUASIPEAK
5		812.467	-8.513	41.635	33.122	-12.878	46.000	QUASIPEAK
6		995.150	-3.972	40.630	36.659	-17.341	54.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	**Time : 2012/09/07 - 20:36**
Limit : FCC_CLASS_B_03M_QP	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2441MHz**

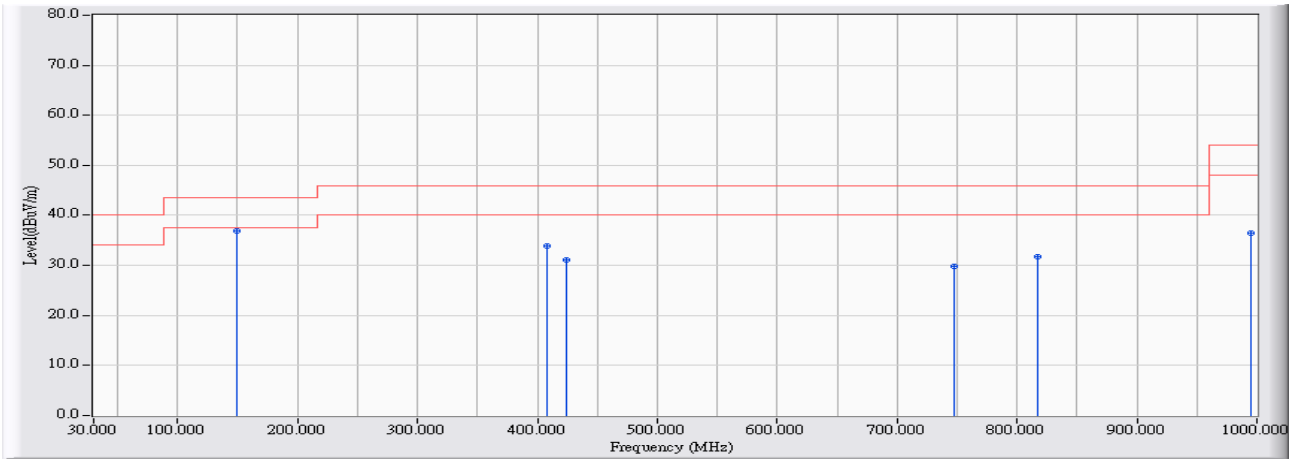


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	149.633	-11.580	44.288	32.708	-10.792	43.500	QUASIPEAK
2		272.500	-14.035	47.985	33.950	-12.050	46.000	QUASIPEAK
3		406.683	-10.949	43.180	32.231	-13.769	46.000	QUASIPEAK
4		544.100	-9.597	38.129	28.532	-17.468	46.000	QUASIPEAK
5		744.567	-8.760	39.195	30.435	-15.565	46.000	QUASIPEAK
6		995.150	-3.972	46.278	42.307	-11.693	54.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	**Time : 2012/09/07 - 20:36**
Limit : FCC_CLASS_B_03M_QP	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**

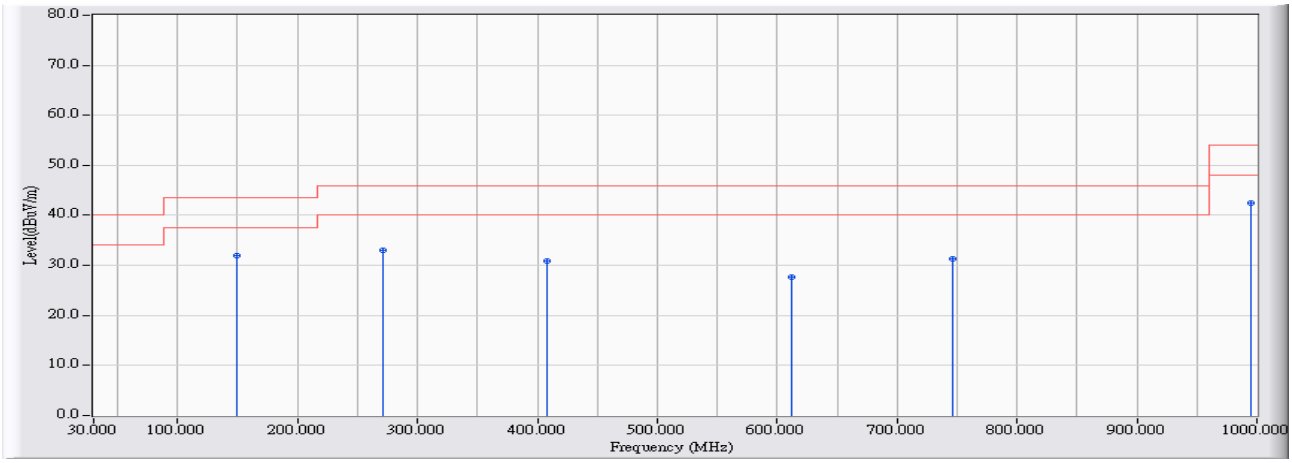


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	149.633	-11.580	48.437	36.857	-6.643	43.500	QUASIPEAK
2		408.300	-10.929	44.774	33.845	-12.155	46.000	QUASIPEAK
3		424.467	-10.717	41.896	31.179	-14.821	46.000	QUASIPEAK
4		747.800	-8.730	38.644	29.913	-16.087	46.000	QUASIPEAK
5		817.317	-8.550	40.306	31.756	-14.244	46.000	QUASIPEAK
6		995.150	-3.972	40.458	36.487	-17.513	54.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	**Time : 2012/09/07 - 20:37**
Limit : FCC_CLASS_B_03M_QP	**Margin : 6**
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**



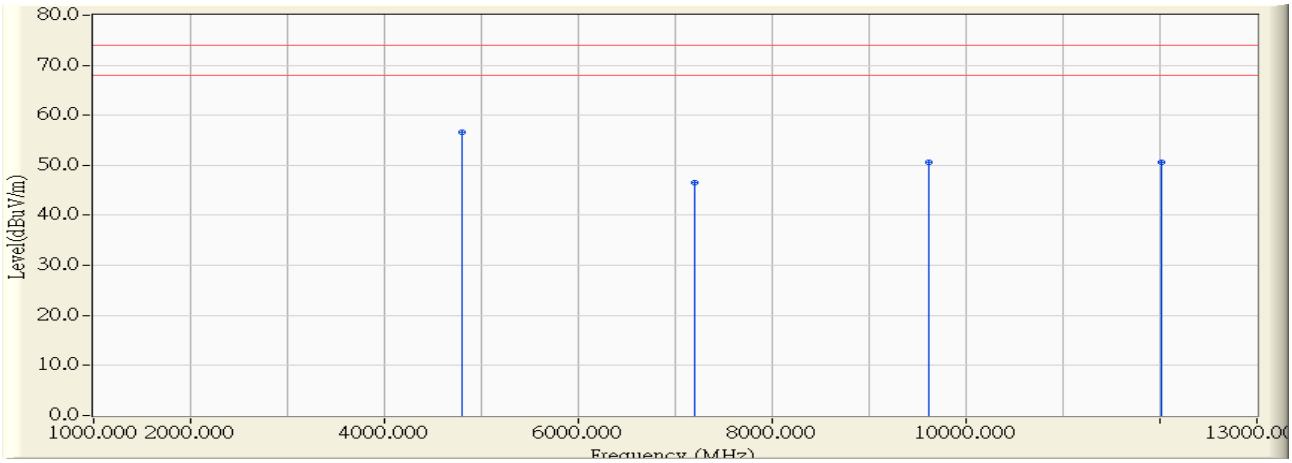
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		149.633	-11.580	43.585	32.005	-11.495	43.500	QUASIPEAK
2		270.883	-14.103	47.036	32.933	-13.067	46.000	QUASIPEAK
3		408.300	-10.929	41.804	30.875	-15.125	46.000	QUASIPEAK
4		612.000	-7.370	35.030	27.659	-18.341	46.000	QUASIPEAK
5		746.183	-8.745	40.085	31.340	-14.660	46.000	QUASIPEAK
6	*	995.150	-3.972	46.522	42.551	-11.449	54.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Harmonic & Spurious:

Site : CB1	**Time : 2012/09/07 - 17:50**
Limit : FCC_SpartC_15.247_H_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

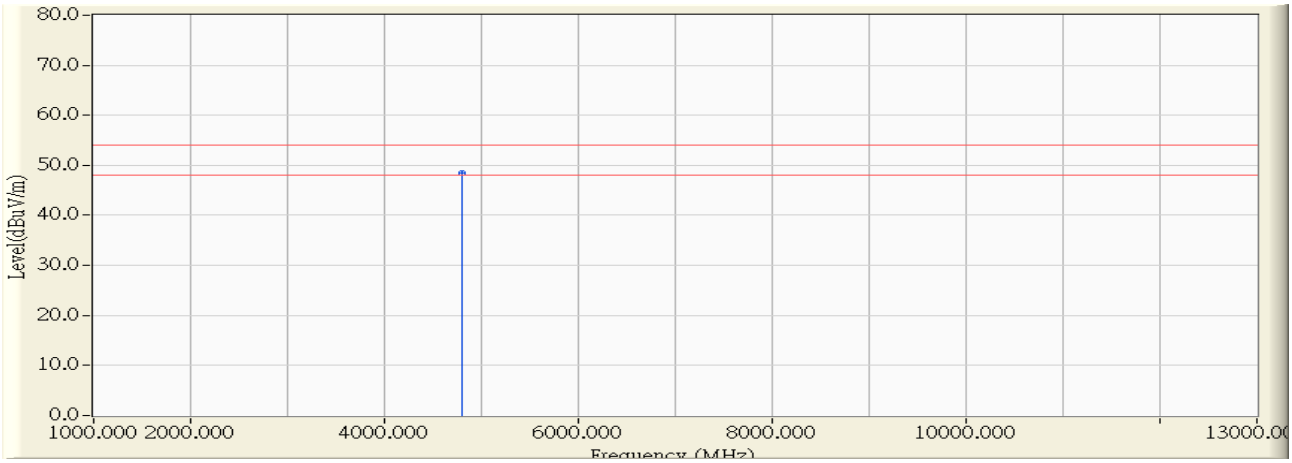


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4804.310	-0.854	57.580	56.725	-17.275	74.000	54.000	PEAK
2		7206.240	5.424	41.020	46.445	-27.555	74.000	54.000	PEAK
3		9608.070	8.941	41.700	50.641	-23.359	74.000	54.000	PEAK
4		12009.900	11.544	39.080	50.624	-23.376	74.000	54.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 17:51**
Limit : FCC_SpartC_15.247_H_03M_AV	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

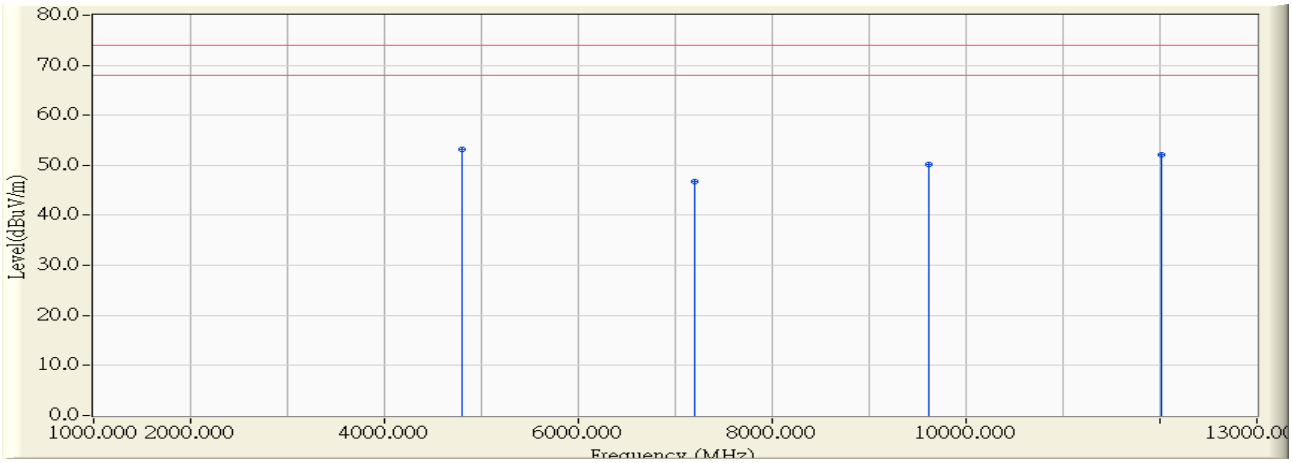


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4804.030	-0.856	49.390	48.534	-5.466	74.000	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 17:54**
Limit : FCC_SpartC_15.247_H_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

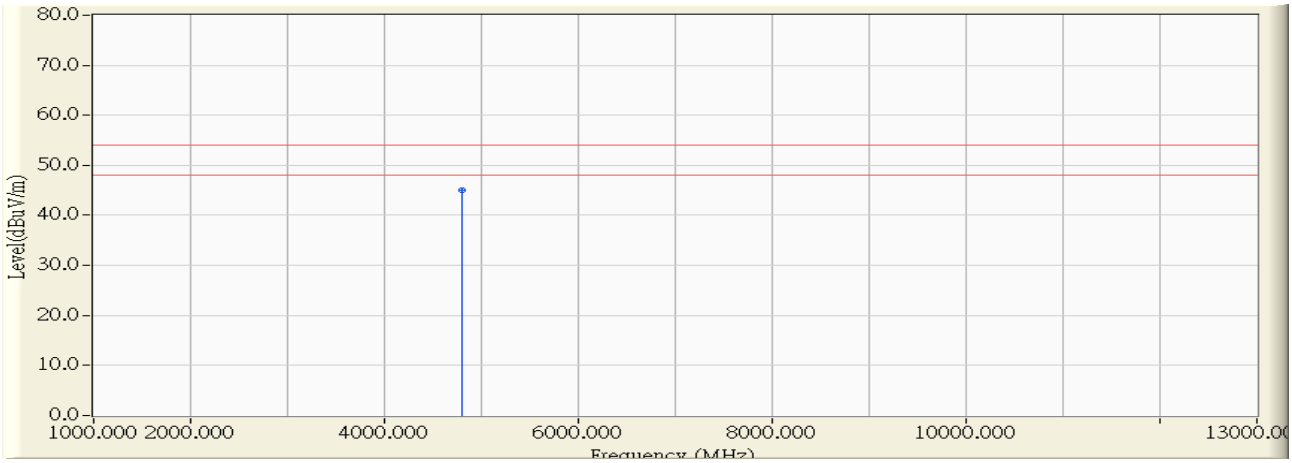


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4804.170	-0.854	54.040	53.185	-0.815	74.000	54.000	PEAK
2		7206.230	5.424	41.390	46.815	-7.185	74.000	54.000	PEAK
3		9608.080	8.941	41.330	50.271	-23.729	74.000	54.000	PEAK
4		12010.090	11.544	40.580	52.124	-21.876	74.000	54.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 17:58**
Limit : FCC_SpartC_15.247_H_03M_AV	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

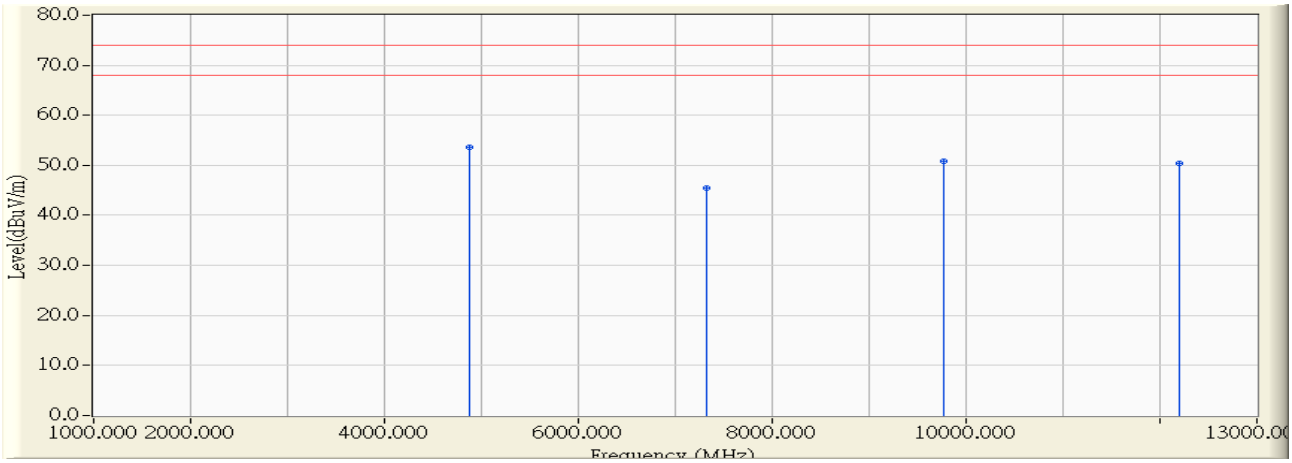


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4803.990	-0.856	45.880	45.024	-8.976	74.000	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 18:27**
Limit : FCC_SpartC_15.247_H_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2441MHz**

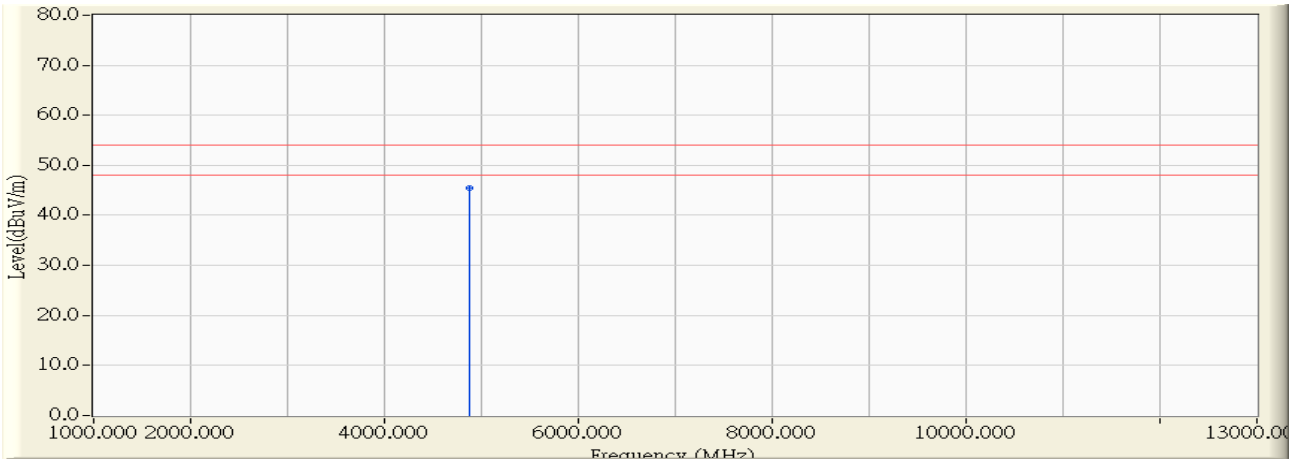


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4881.730	-0.652	54.280	53.628	-20.372	74.000	54.000	PEAK
2		7323.080	5.706	39.750	45.457	-28.543	74.000	54.000	PEAK
3		9764.070	10.072	40.770	50.842	-23.158	74.000	54.000	PEAK
4		12204.930	11.474	38.930	50.404	-23.596	74.000	54.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 18:28**
Limit : FCC_SpartC_15.247_H_03M_AV	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2441MHz**

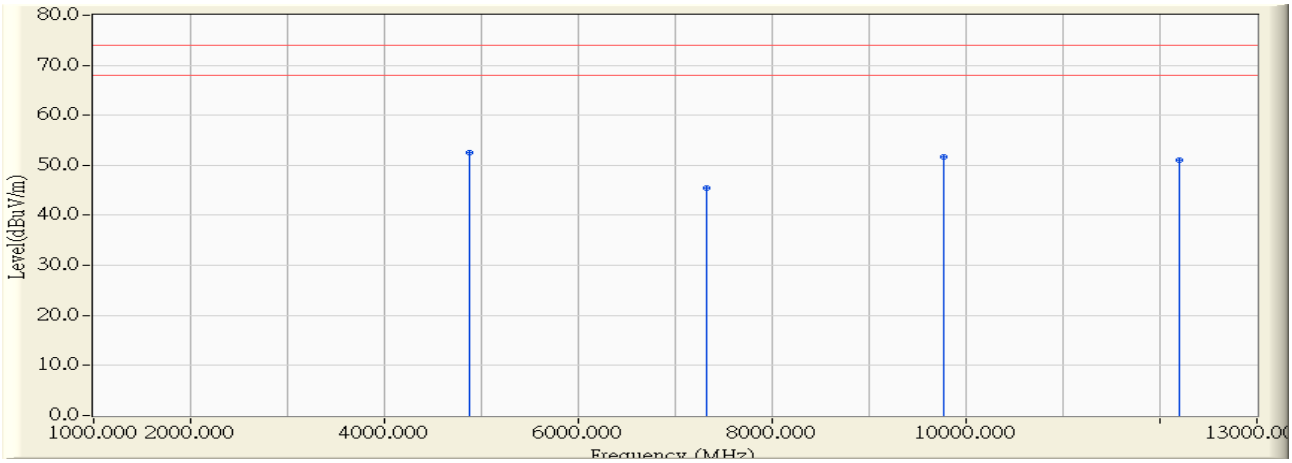


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4882.030	-0.651	46.200	45.549	-8.451	74.000	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 18:35**
Limit : FCC_SpartC_15.247_H_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2441MHz**

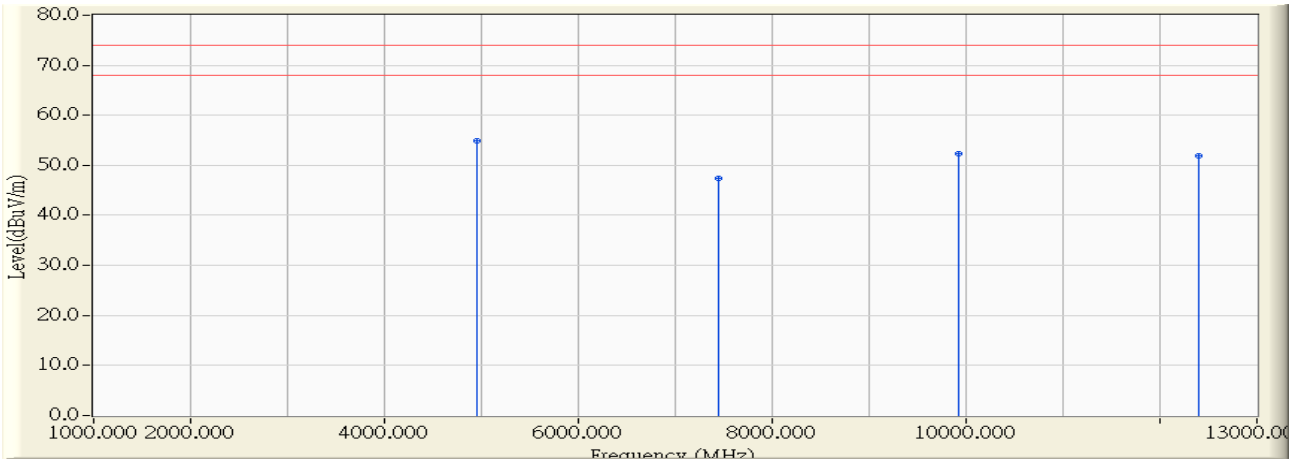


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4881.680	-0.652	53.180	52.528	-21.472	74.000	54.000	PEAK
2		7323.020	5.706	39.860	45.566	-28.434	74.000	54.000	PEAK
3		9764.260	10.074	41.520	51.593	-22.407	74.000	54.000	PEAK
4		12204.970	11.474	39.580	51.054	-22.946	74.000	54.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 17:35**
Limit : FCC_SpartC_15.247_H_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**

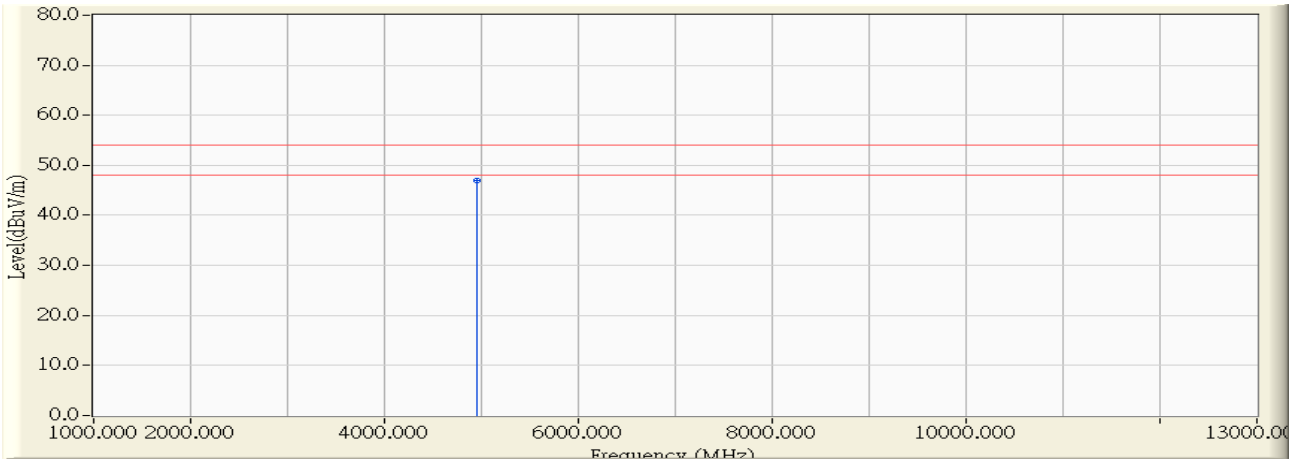


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4959.620	-0.447	55.370	54.923	-19.077	74.000	54.000	PEAK
2		7440.080	5.989	41.330	47.319	-26.681	74.000	54.000	PEAK
3		9919.940	11.202	41.050	52.252	-21.748	74.000	54.000	PEAK
4		12399.740	11.405	40.530	51.935	-22.065	74.000	54.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 17:36**
Limit : FCC_SpartC_15.247_H_03M_AV	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**

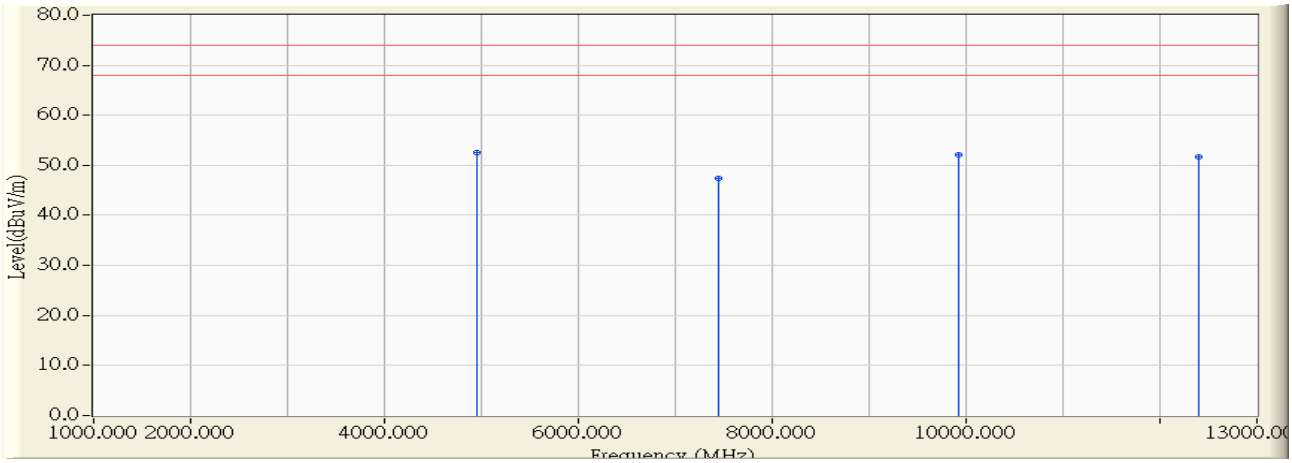


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4960.100	-0.446	47.430	46.984	-7.016	74.000	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	**Time : 2012/09/07 - 17:40**
Limit : FCC_SpartC_15.247_H_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector Type
1	*	4959.720	-0.447	53.090	52.643	-21.357	74.000	54.000	PEAK
2		7440.110	5.989	41.490	47.479	-26.521	74.000	54.000	PEAK
3		9920.180	11.203	40.890	52.093	-21.907	74.000	54.000	PEAK
4		12400.070	11.405	40.360	51.765	-22.235	74.000	54.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

4. RF antenna conducted test

4.1. Test Equipment

The following test equipment is used during the test:

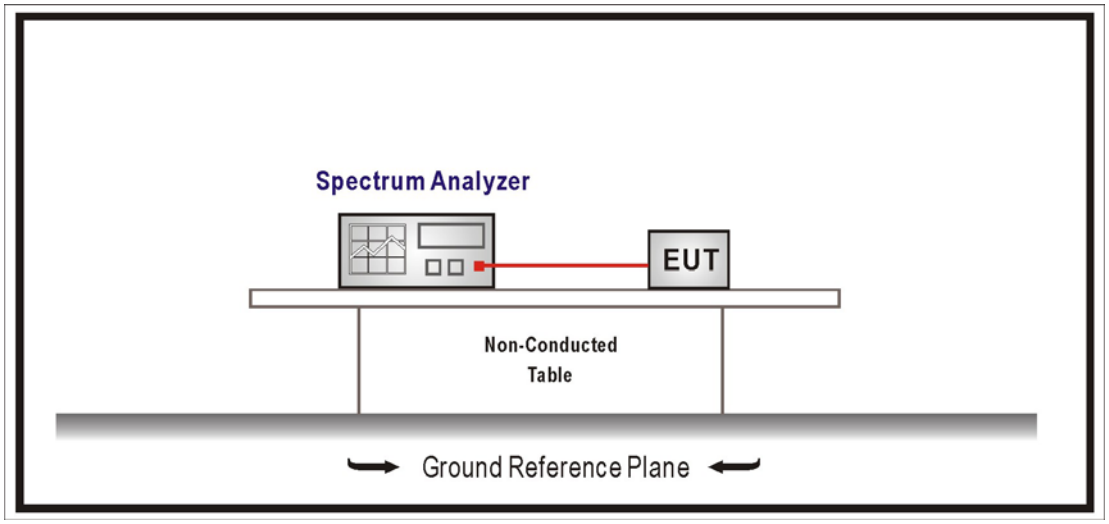
RF antenna conducted test / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

4.2. Test Setup

RF Conducted Measurement:



4.3. Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on an RF conducted or radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

4.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements

Set RBW = 100 kHz, Set VBW> RBW, scan up through 10th harmonic.

4.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2011

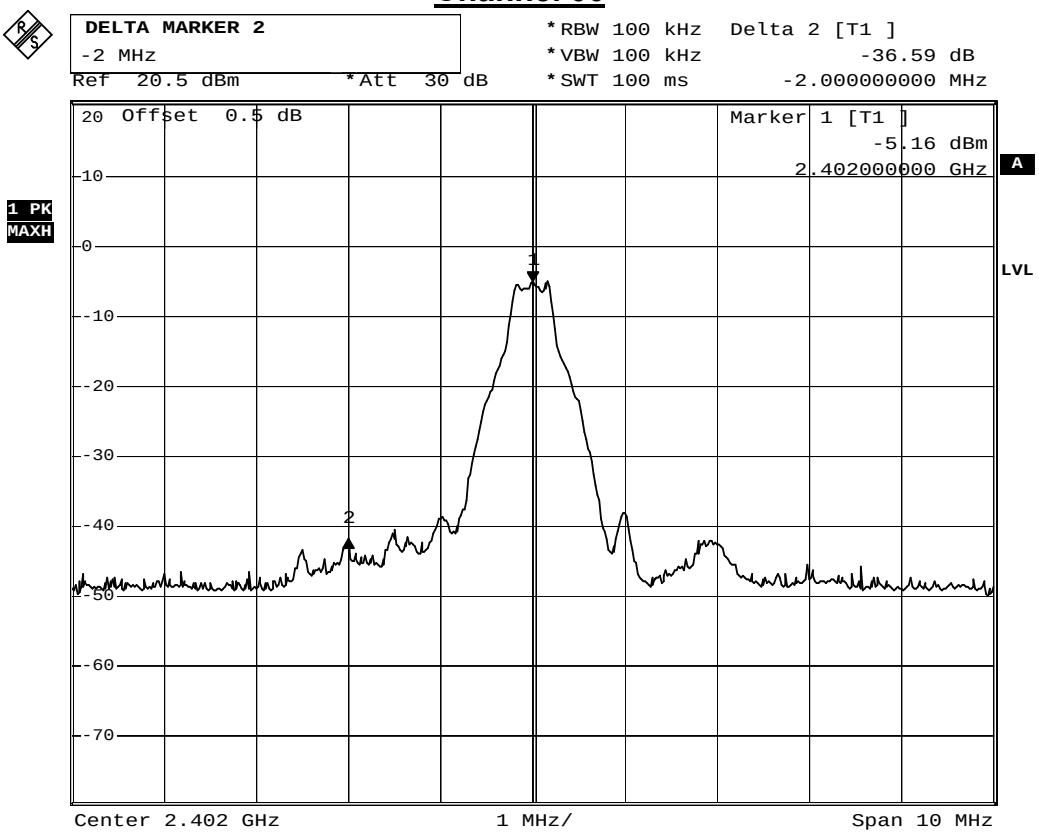
4.6. Test Result

Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measurement Level (dB)	Required Limit (dBc)	Result
00	2402	36.590	≧20	Pass

Channel 00

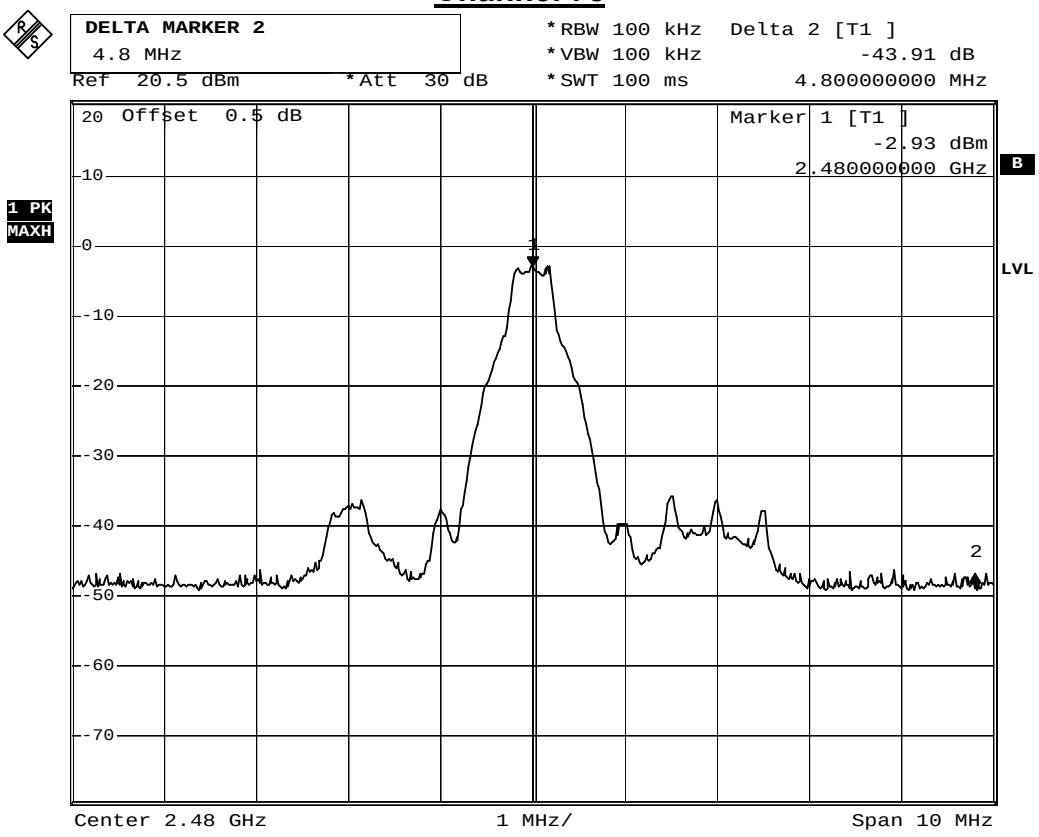


Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measurement Level (dB)	Required Limit (dBc)	Result
78	2480	43.910	≧20	Pass

Channel 78

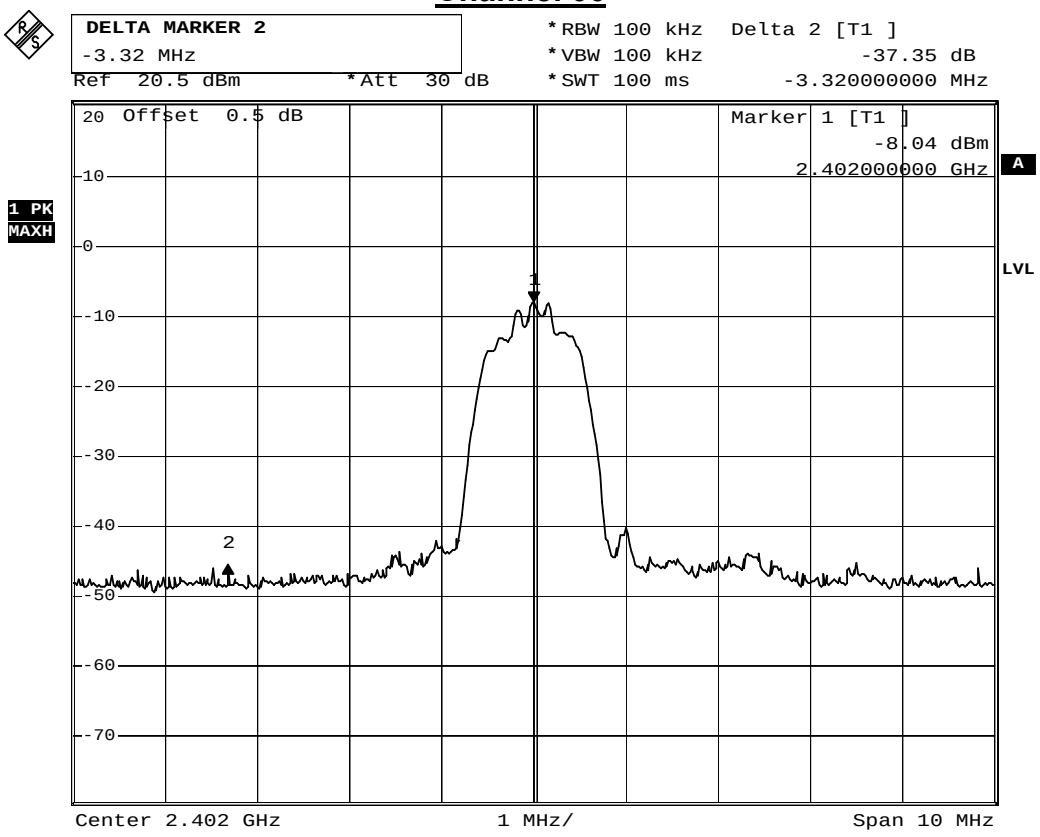


Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measurement Level (dB)	Required Limit (dBc)	Result
00	2402	37.350	≧20	Pass

Channel 00

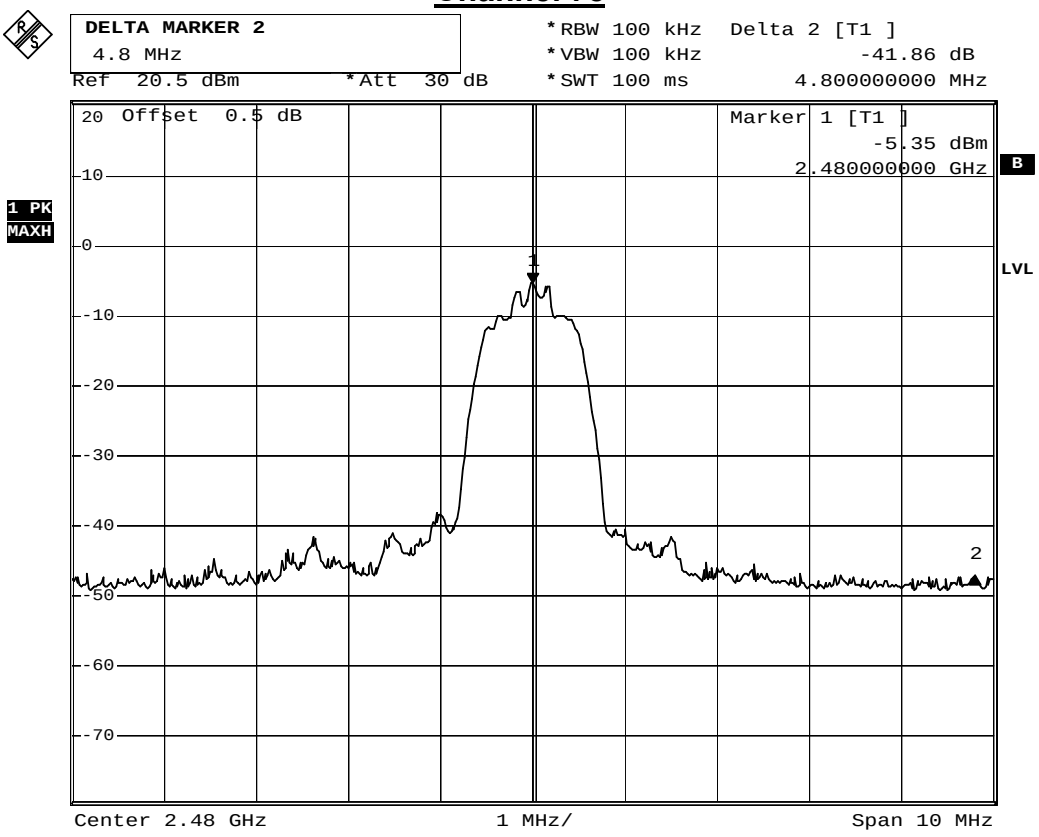


Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measurement Level (dB)	Required Limit (dBc)	Result
78	2480	41.860	≧20	Pass

Channel 78



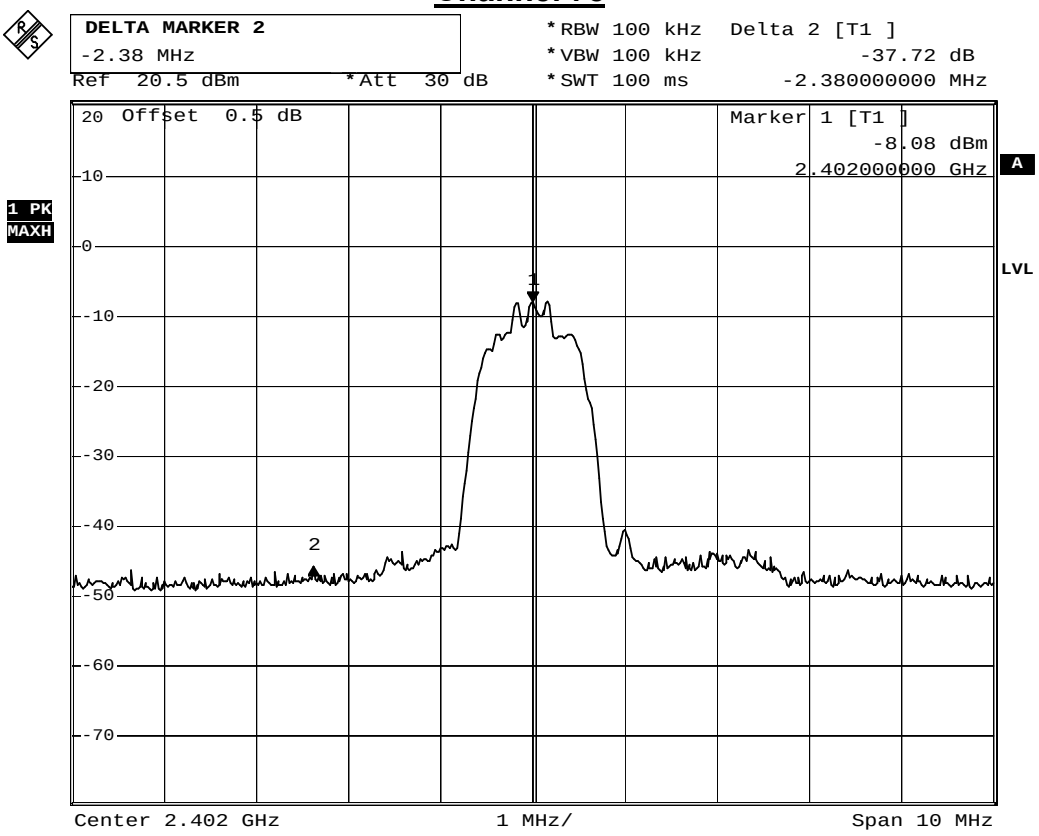
Date: 10.SEP.2012 14:43:58

Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measurement Level (dB)	Required Limit (dBc)	Result
00	2402	37.720	≧20	Pass

Channel 78



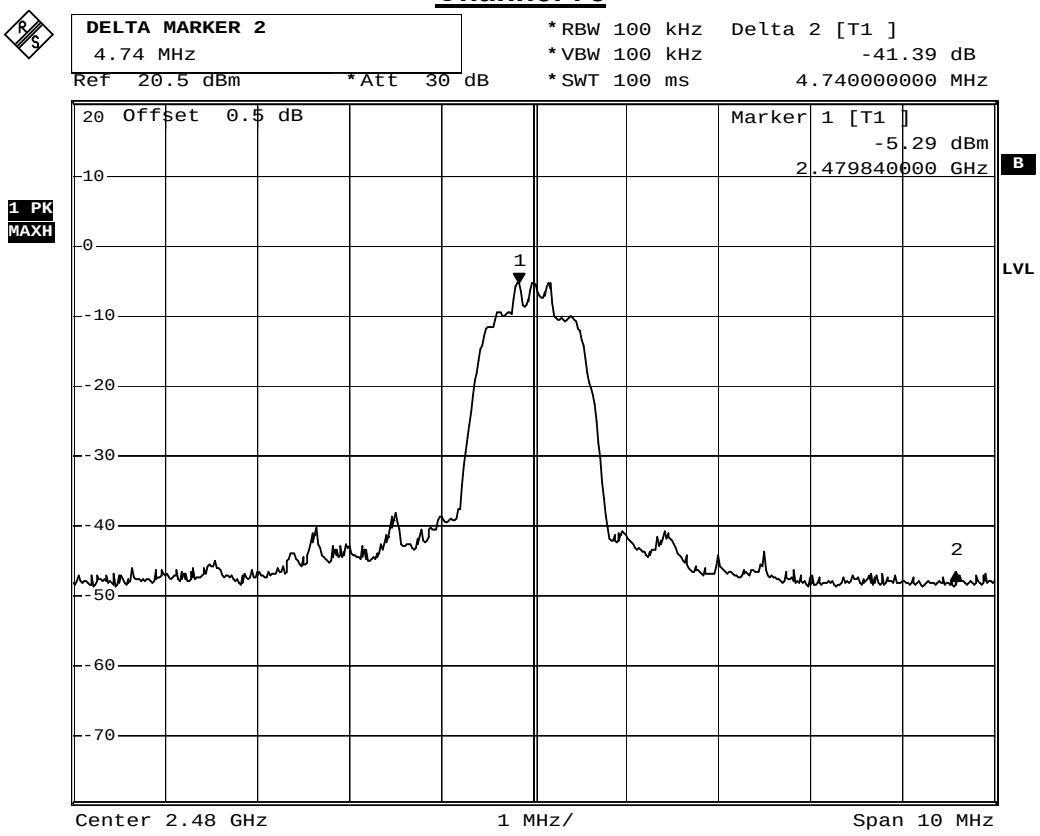
Date: 10.SEP.2012 14:40:15

Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

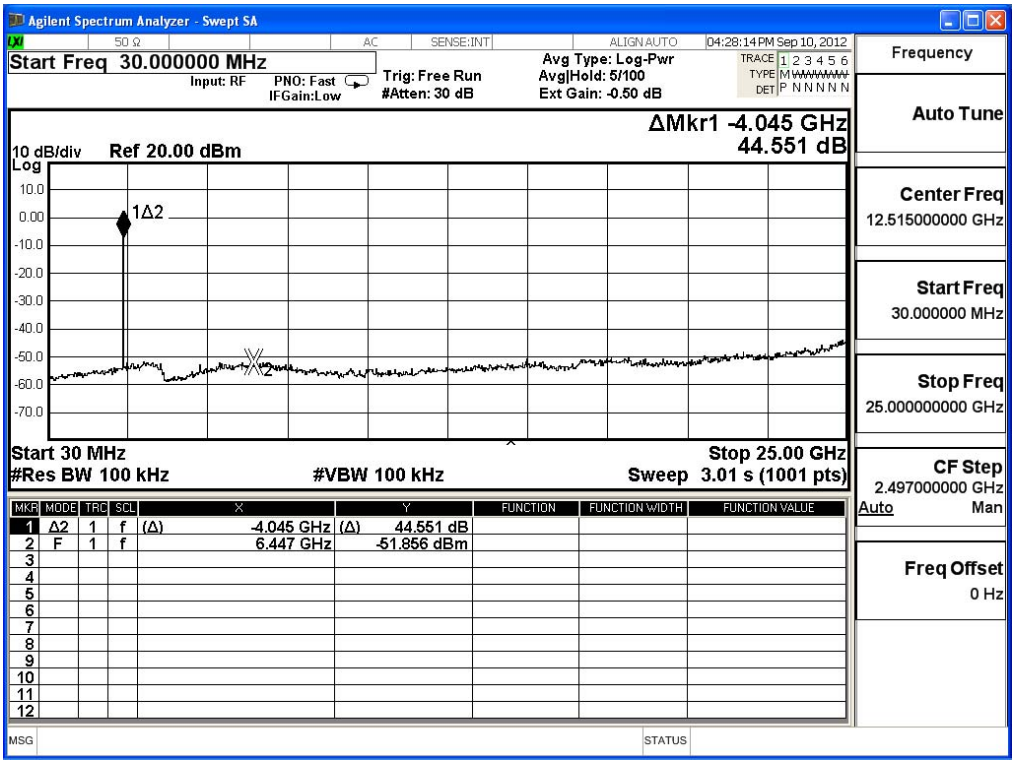
Channel No.	Frequency (MHz)	Measurement Level (dB)	Required Limit (dBc)	Result
78	2480	41.390	≧20	Pass

Channel 78

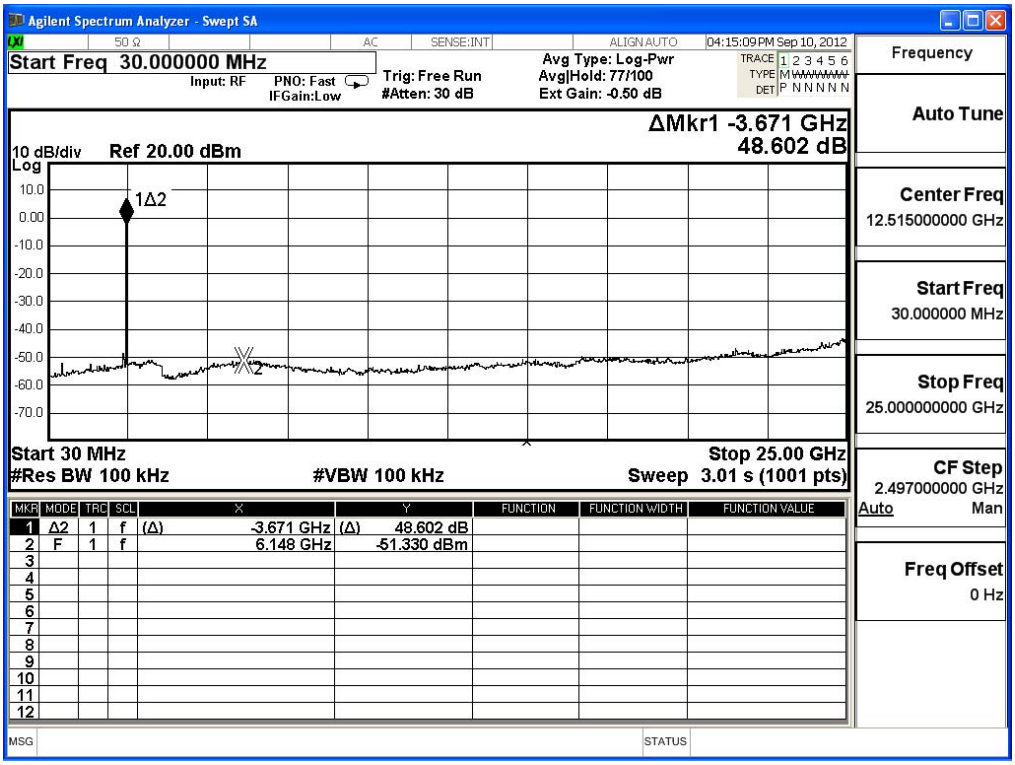


Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

Channel 00 (30MHz-25GHz)- GFSK

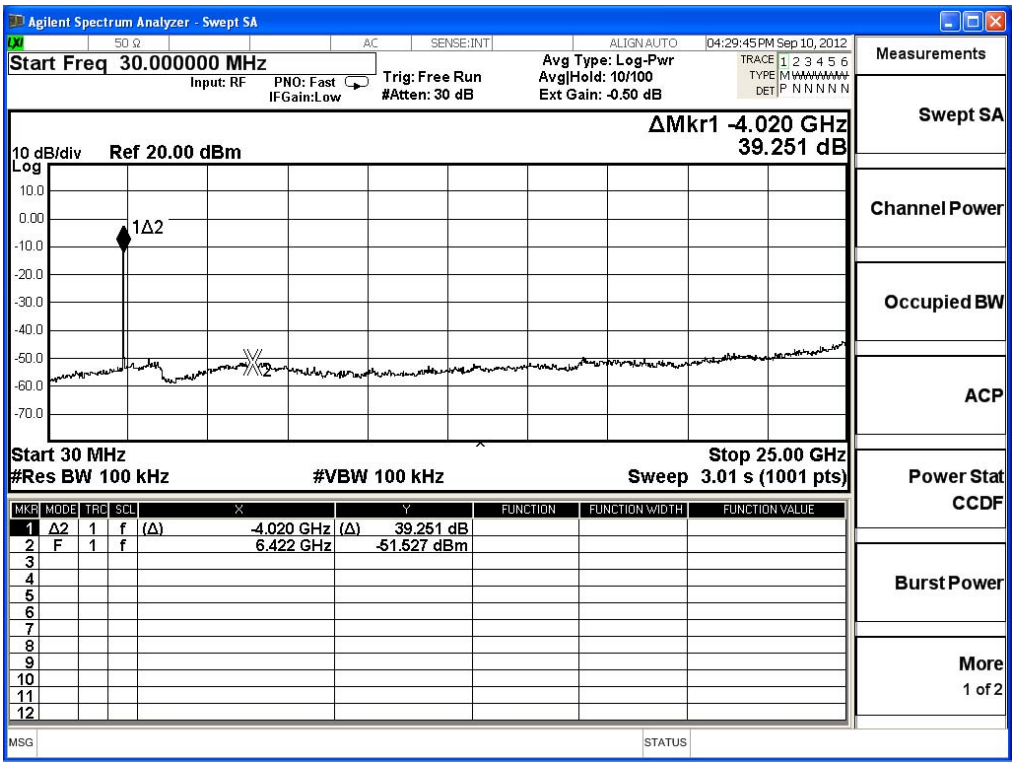


Channel 78 (30MHz~25GHz)- GFSK

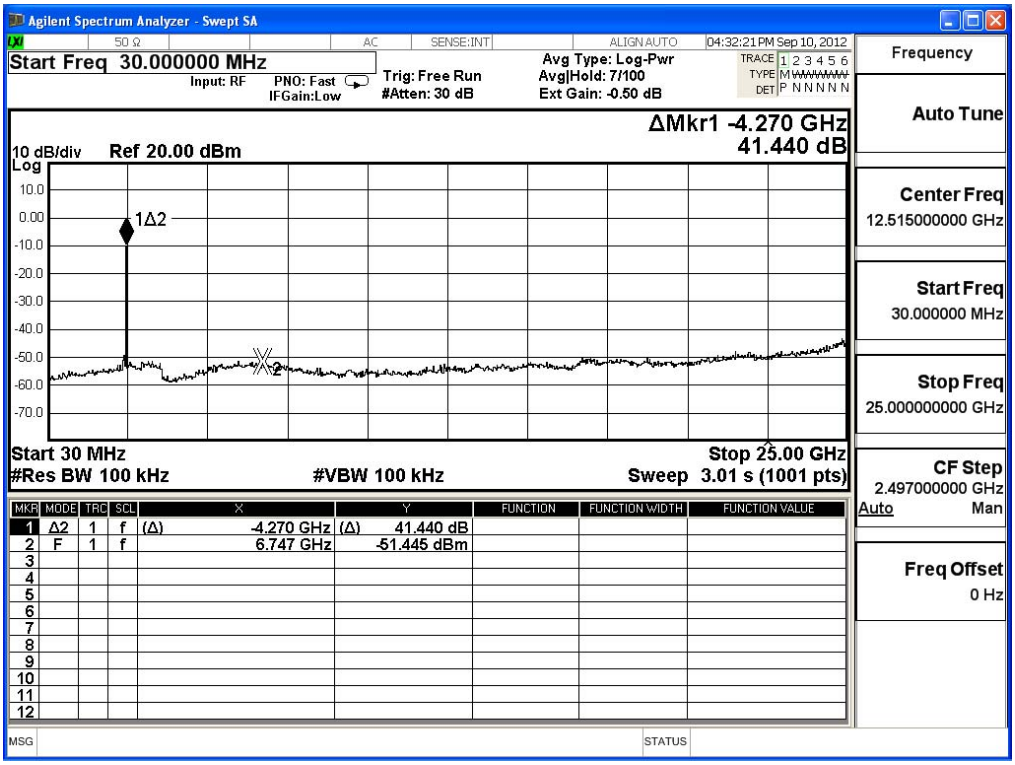


Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

Channel 00 (30MHz-25GHz)- π/4-DQPSK

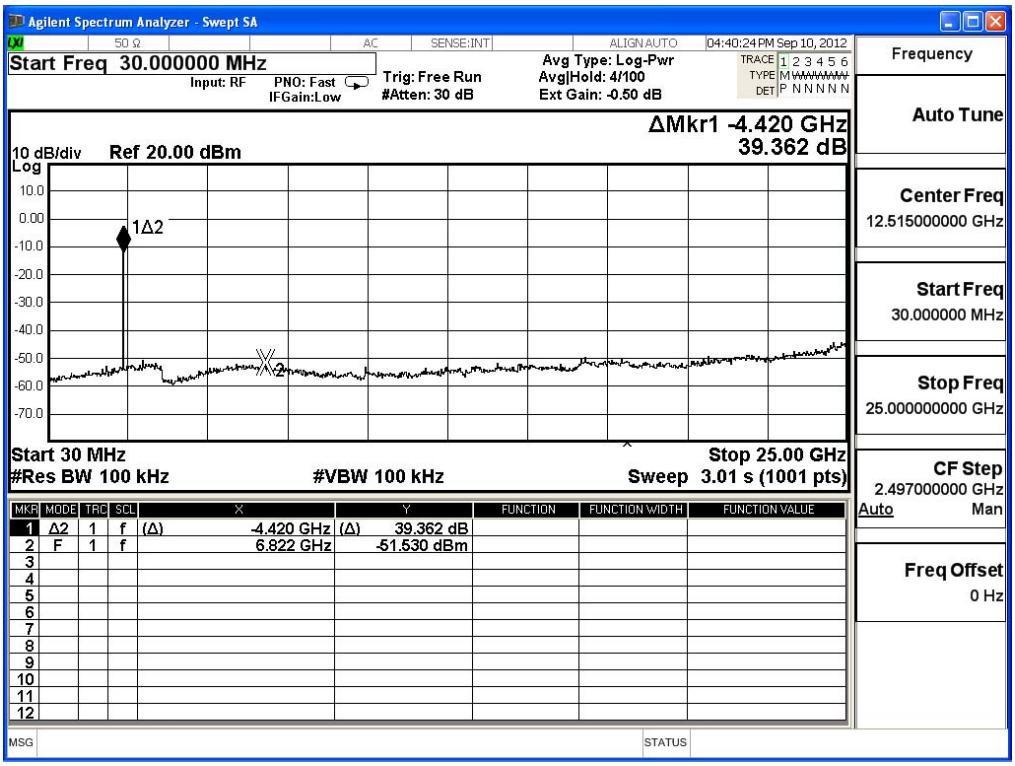


Channel 78 (30MHz~25GHz)- π/4-DQPSK

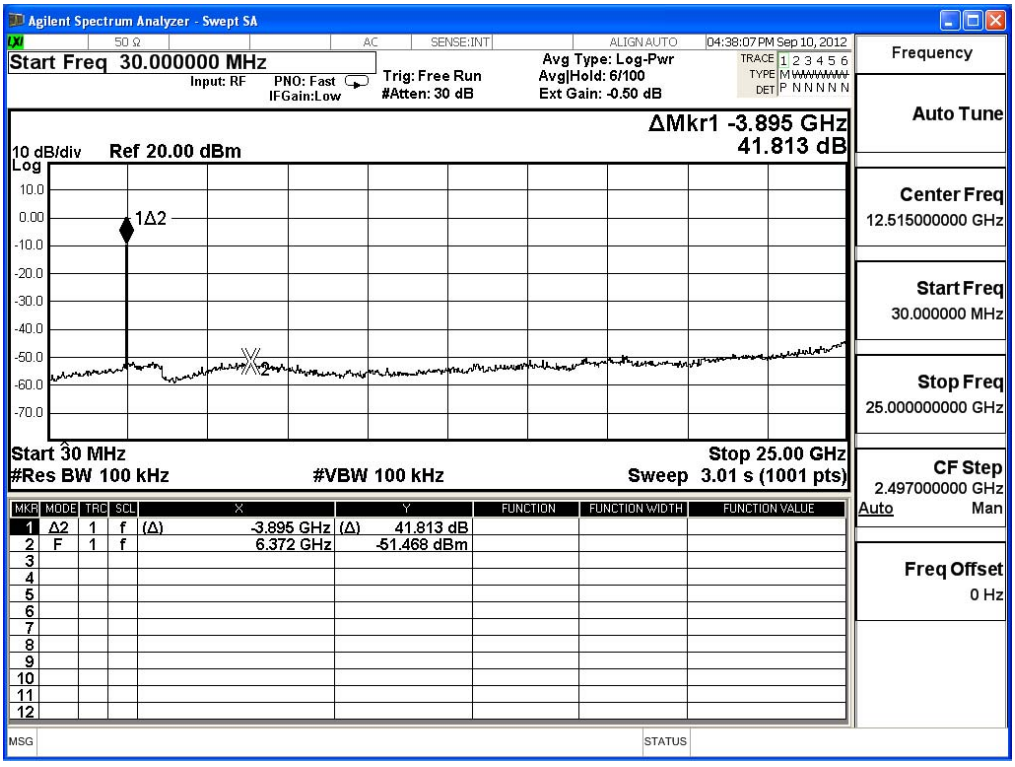


Product	Navigation system		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

Channel 00 (30MHz-25GHz)- 8-DPSK



Channel 78 (30MHz~25GHz)- 8-DPSK



5. Band Edge

5.1. Test Equipment

The following test equipments are used during the test:

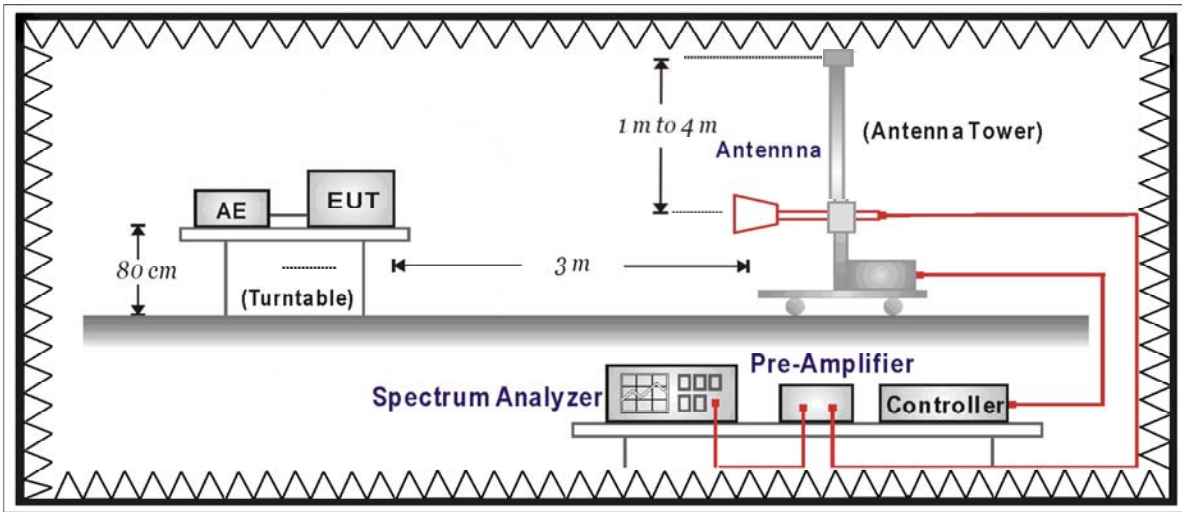
Band Edge / CB1

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Double Ridged Guide Horn Antenna	Schwarzback	BBHA 9120D	743	2013/02/02
Spectrum Analyzer	Agilent	E4440A	MY46187335	2013/02/07
Coaxial Cable	Huber+Suhner AG	Sucoflex 102	25623/2	2013/03/04

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

5.2. Test Setup

RF Radiated Measurement:



5.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

5.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2009 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

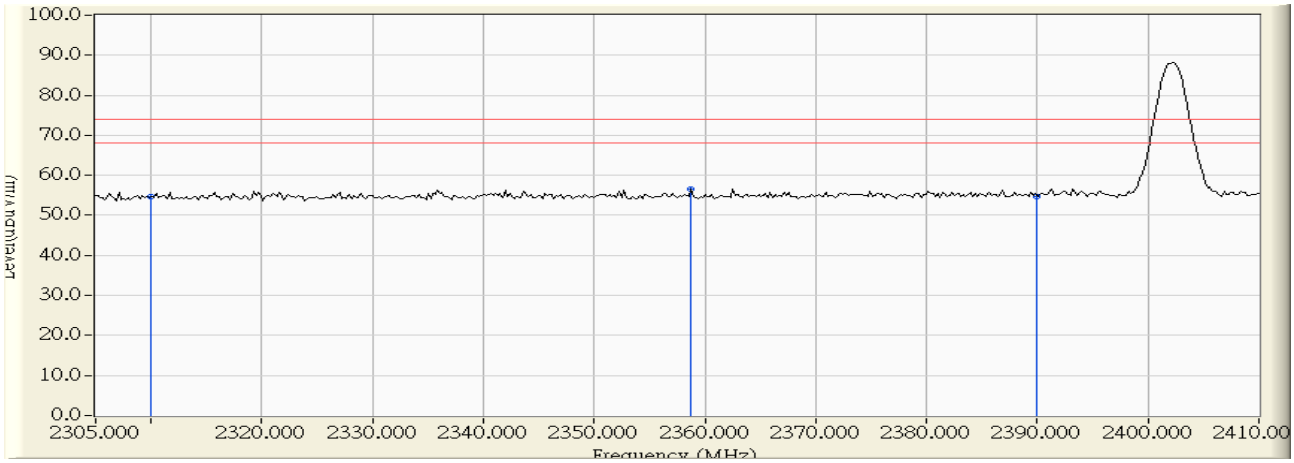
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2009 on radiated measurement.

5.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2011

5.6. Test Result

Site : CB1	**Time : 2012/09/07 - 17:13**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

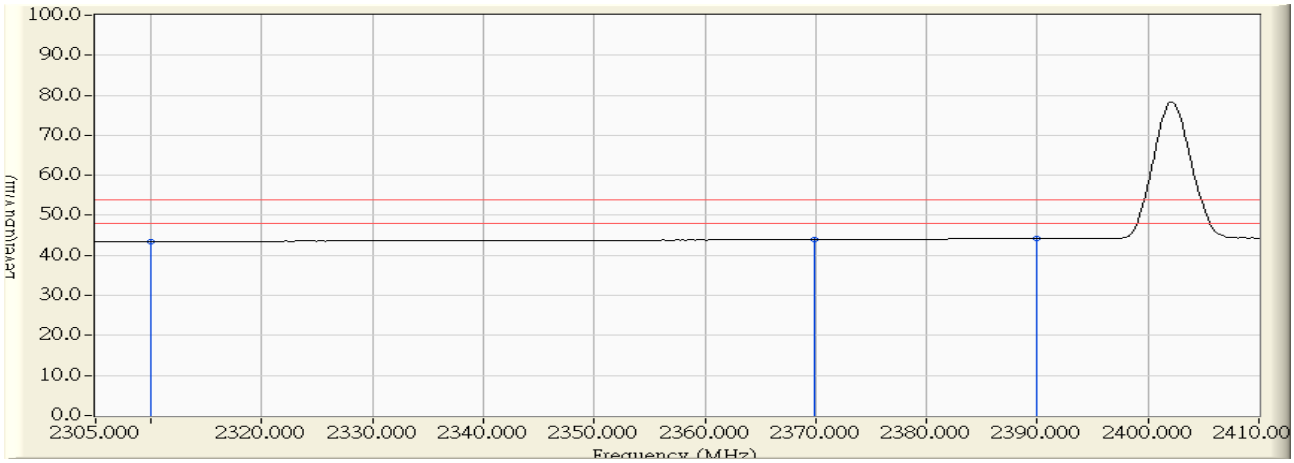


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	29.779	24.867	54.646	-19.354	74.000	PEAK
2	*	2358.760	30.266	26.240	56.506	-17.494	74.000	PEAK
3		2390.000	30.578	24.244	54.822	-19.178	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	**Time : 2012/09/07 - 17:14**
Limit : FCC_SpartC_15.209_03M_AV	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

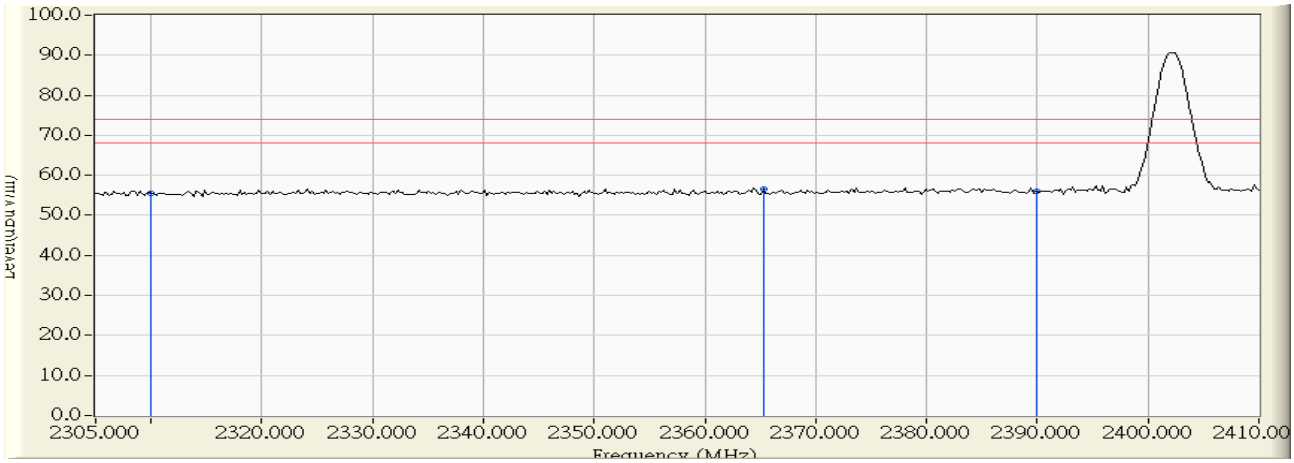


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	29.779	13.653	43.432	-10.568	54.000	AVERAGE
2		2369.890	30.377	13.594	43.971	-10.029	54.000	AVERAGE
3	*	2390.000	30.578	13.629	44.207	-9.793	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	**Time : 2012/09/07 - 17:19**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

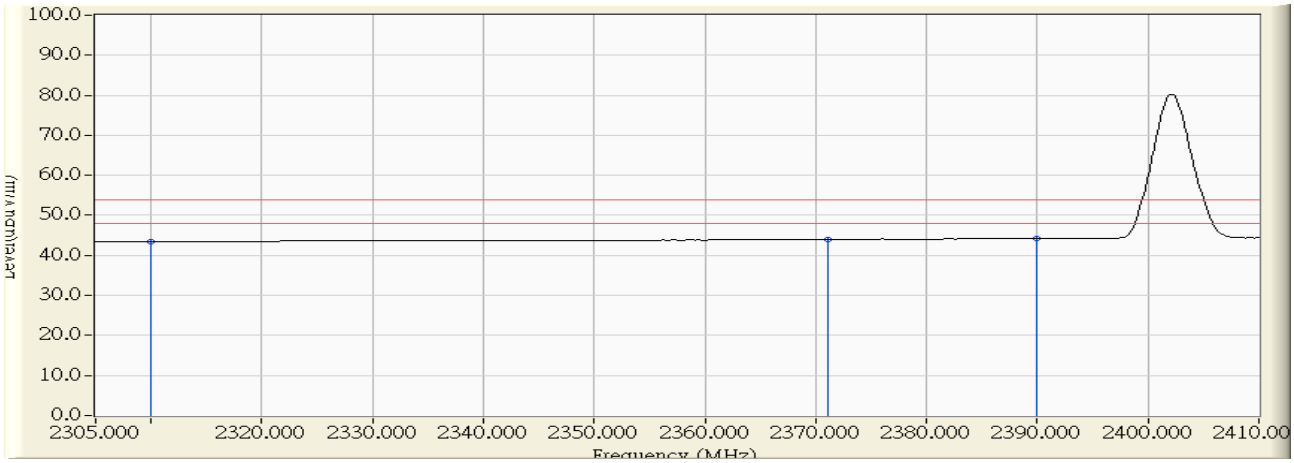


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	29.779	25.697	55.476	-18.524	74.000	PEAK
2	*	2365.270	30.330	26.155	56.486	-17.514	74.000	PEAK
3		2390.000	30.578	25.370	55.948	-18.052	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	**Time : 2012/09/07 - 17:19**
Limit : FCC_SpartC_15.209_03M_AV	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2402MHz**

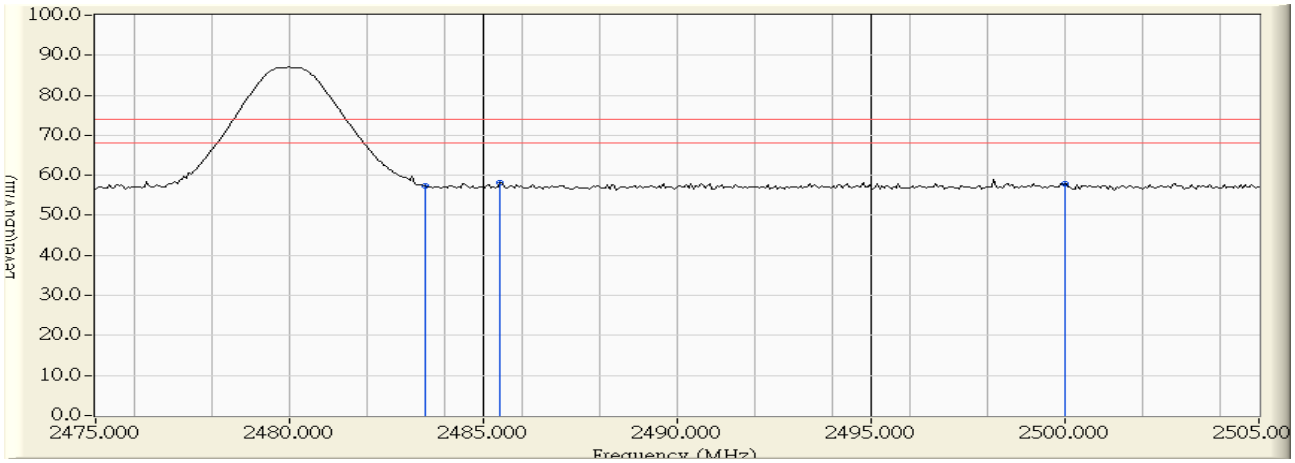


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2310.000	29.779	13.675	43.454	-10.546	54.000	AVERAGE
2		2371.150	30.390	13.603	43.993	-10.007	54.000	AVERAGE
3	*	2390.000	30.578	13.612	44.190	-9.810	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	**Time : 2012/09/07 - 17:25**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**

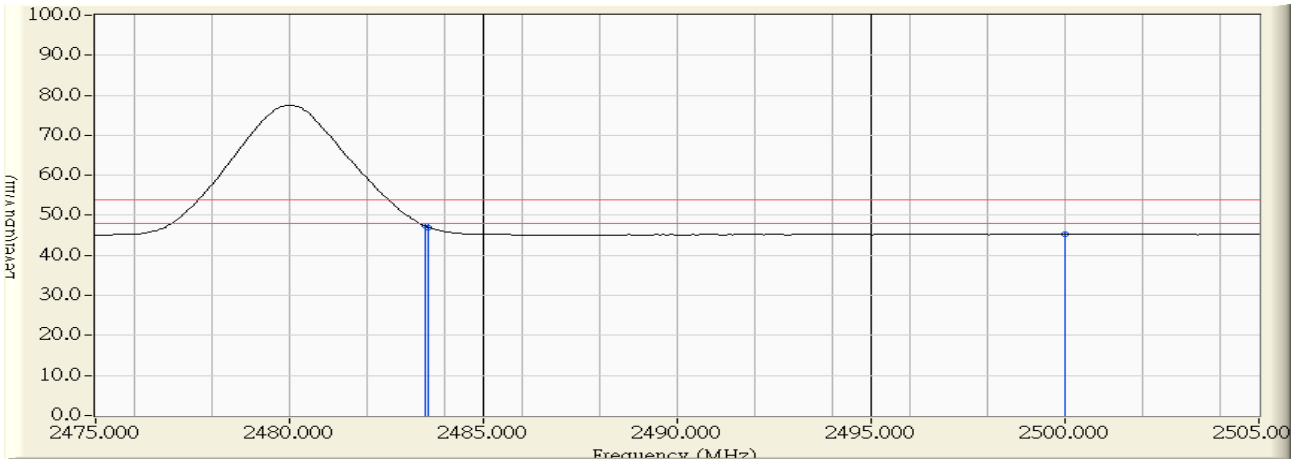


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2483.500	31.512	25.733	57.245	-16.755	74.000	PEAK
2	*	2485.440	31.531	26.728	58.259	-15.741	74.000	PEAK
3		2500.000	31.638	26.210	57.849	-16.151	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	**Time : 2012/09/07 - 17:26**
Limit : FCC_SpartC_15.209_03M_AV	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**

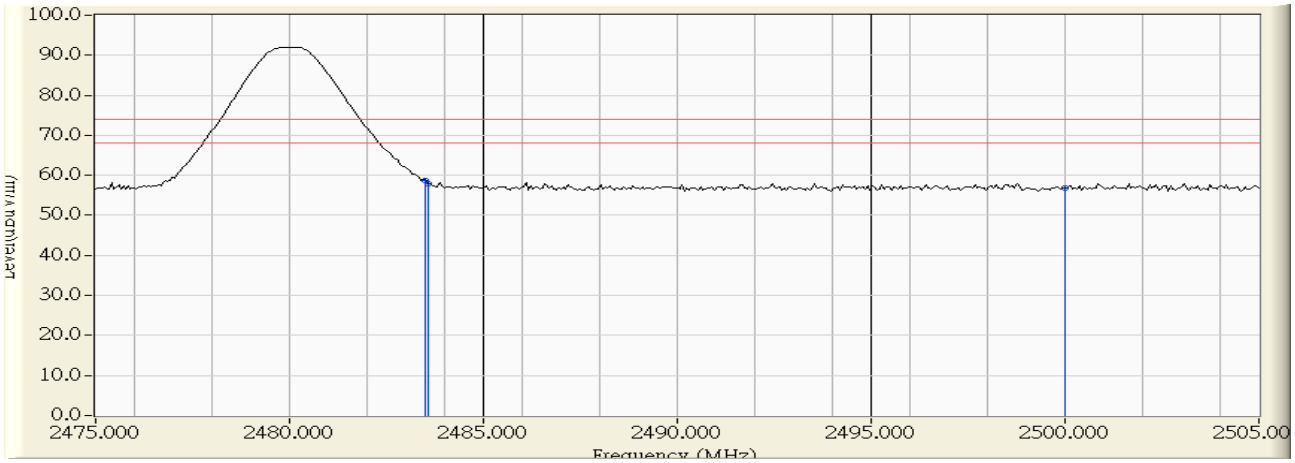


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2483.500	31.512	15.811	47.323	-6.677	54.000	AVERAGE
2		2483.580	31.513	15.479	46.992	-7.008	54.000	AVERAGE
3		2500.000	31.638	13.572	45.211	-8.789	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	**Time : 2012/09/07 - 17:28**
Limit : FCC_SpartC_15.209_03M_PK	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**

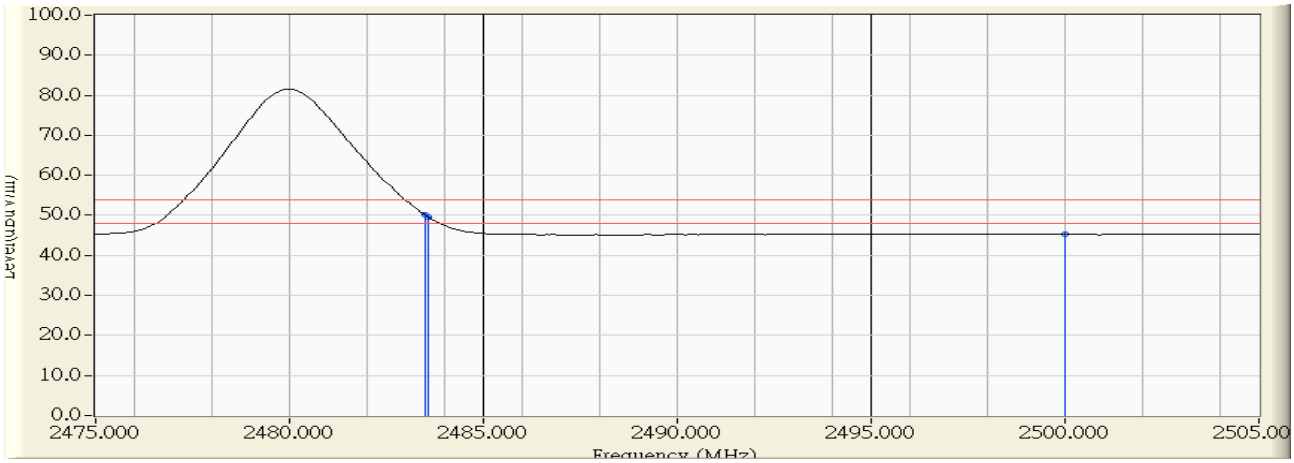


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2483.500	31.512	27.296	58.808	-15.192	74.000	PEAK
2		2483.580	31.513	26.513	58.026	-15.974	74.000	PEAK
3		2500.000	31.638	25.205	56.844	-17.156	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " * ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	**Time : 2012/09/07 - 17:29**
Limit : FCC_SpartC_15.209_03M_AV	**Margin : 6**
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	**Power : DC 12V**
EUT : Navigation system	**Note : 2480MHz**



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2483.500	31.512	18.539	50.051	-3.949	54.000	AVERAGE
2		2483.580	31.513	18.024	49.537	-4.463	54.000	AVERAGE
3		2500.000	31.638	13.583	45.222	-8.778	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

6. Number of hopping frequency

6.1. Test Equipment

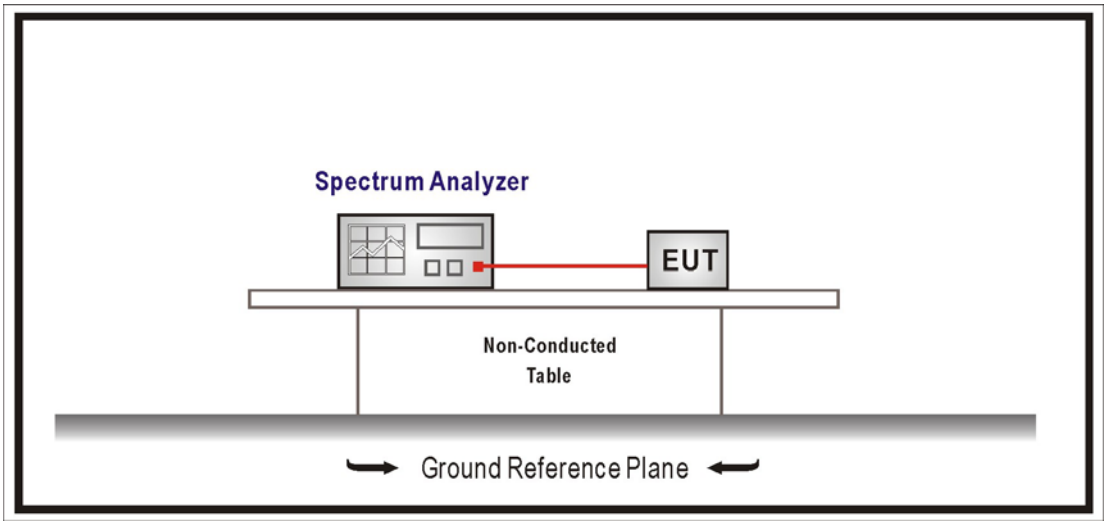
The following test equipment is used during the test:

Number of hopping frequency / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

6.2. Test Setup



6.3. Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

For frequency hopping systems operating in the 2400-2483.5 MHz bands, which use fewer than 75 hopping frequencies, may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

For frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies.

6.4. Test Procedures

The EUT was setup according to ANSI C63.4, 2009 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements

Span = the frequency band of operation

RBW ≥ 1% of the span ， VBW ≥ RBW

Sweep = auto, Detector function = peak, Trace = max hold

6.5. Test Specification

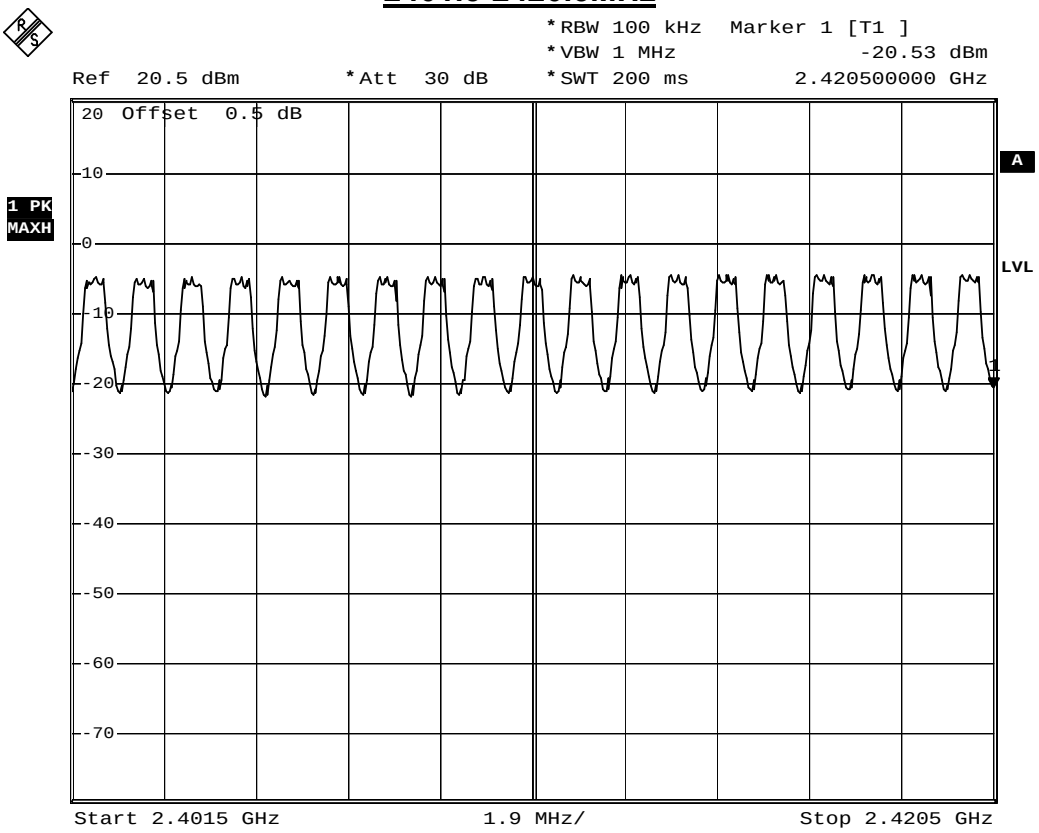
According to FCC Part 15 Subpart C Paragraph 15.247: 2011

6.6. Test Result

Product	Navigation system		
Test Item	Number of hopping frequency		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

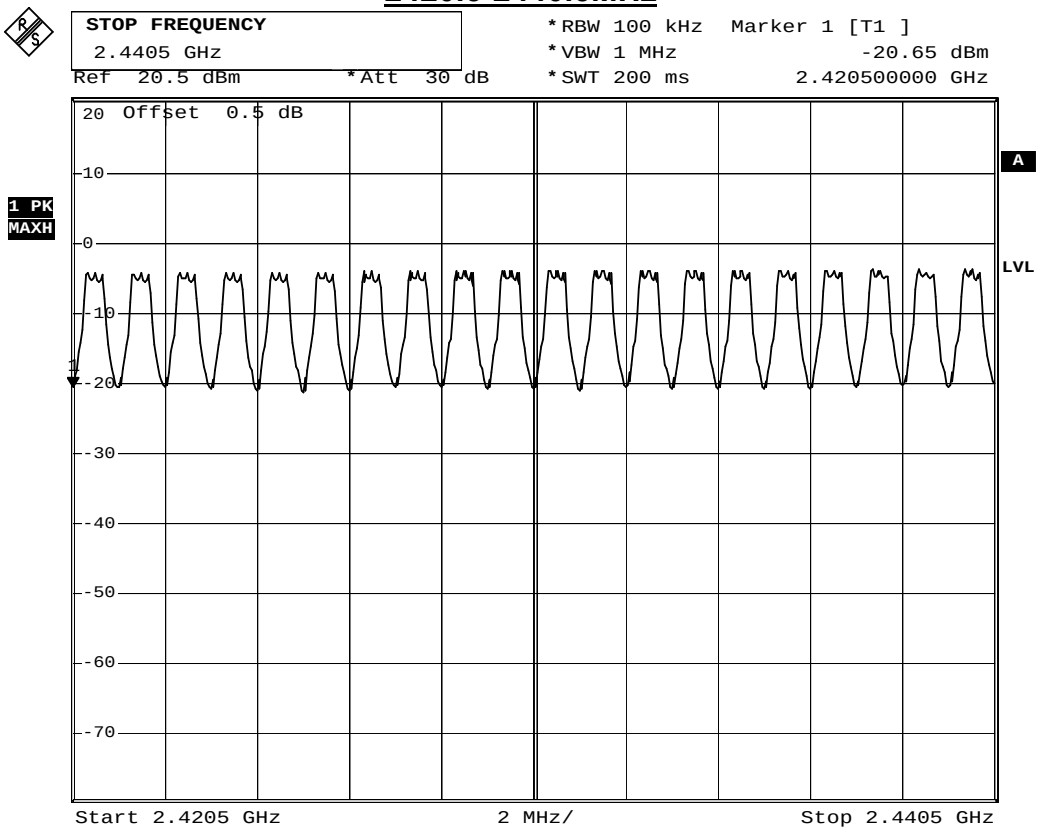
Frequency Range (MHz)	Measure Level (Channels)	Limit (Channels)	Result
2402 - 2480	79	≧ 75	PASS

2401.5-2420.5MHz



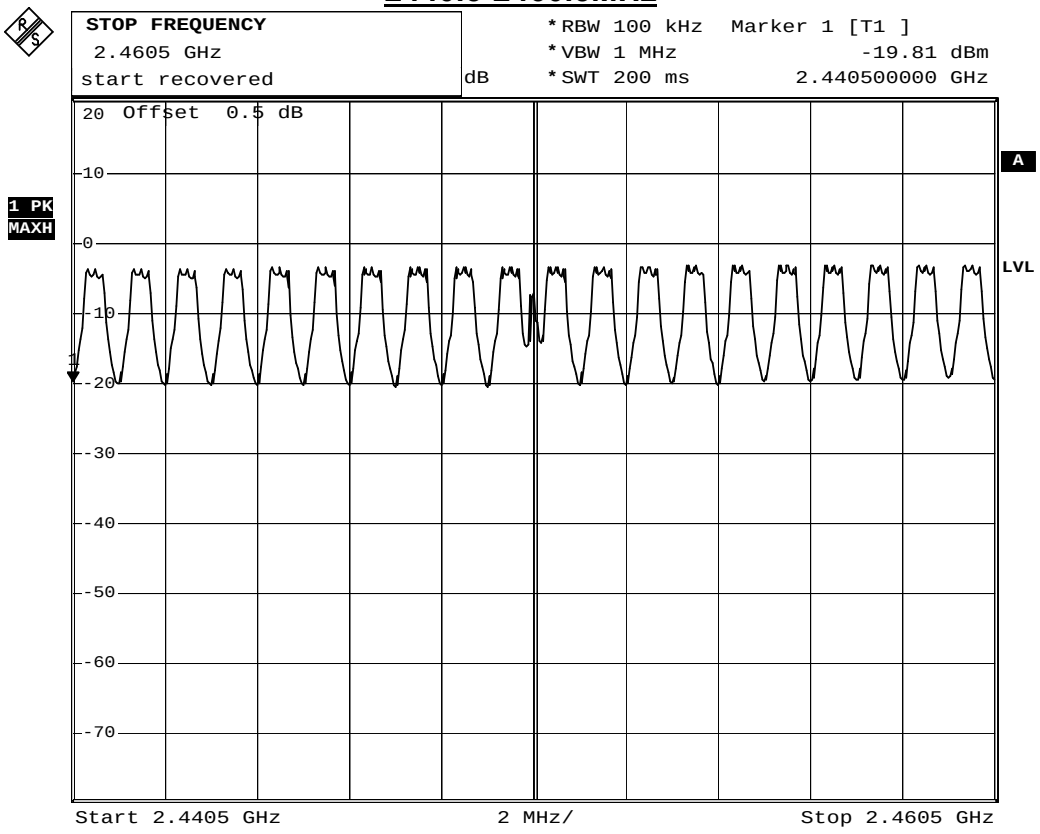
Date: 10.SEP.2012 16:31:16

2420.5-2440.5MHz



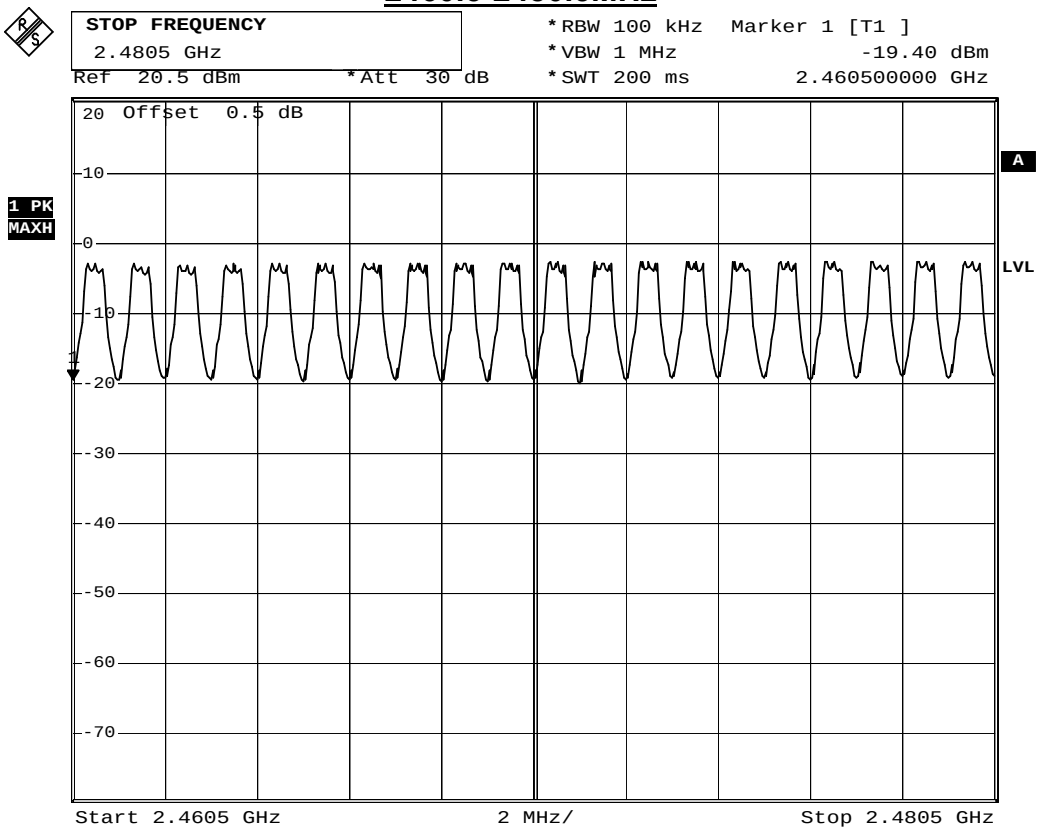
Date: 10.SEP.2012 16:38:24

2440.5-2460.5MHz



Date: 10.SEP.2012 16:54:18

2460.5-2480.5MHz



Date: 10.SEP.2012 17:01:10

7. Carrier Frequency Separation

7.1. Test Equipment

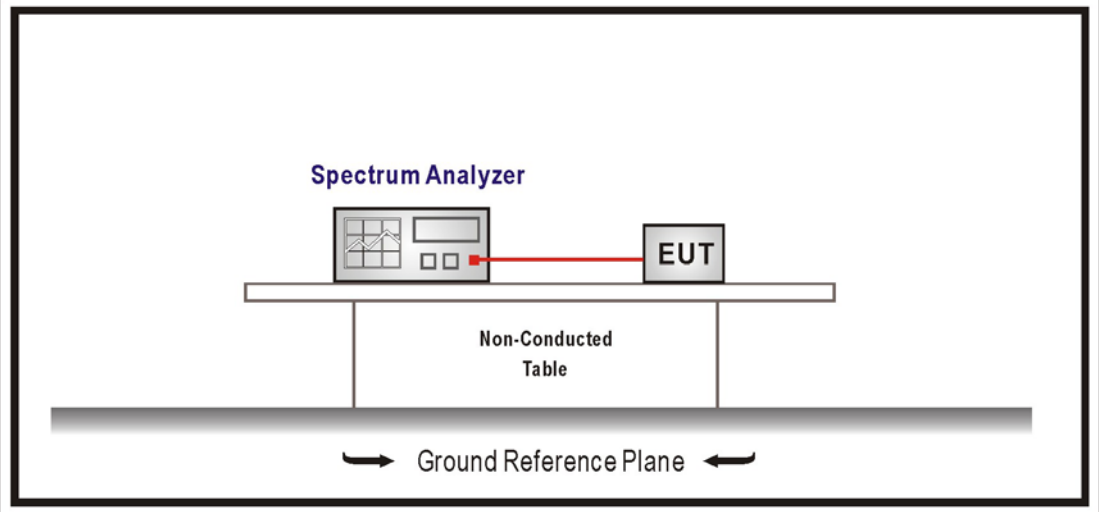
The following test equipment is used during the test:

Carrier Frequency Separation / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

7.2. Test Setup



7.3. Limits

For frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

7.4. Test Procedures

The EUT was setup according to ANSI C63.4, 2009 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements

Span = wide enough to capture the peaks of two adjacent channels

Resolution Bandwidth (RBW) ≥ 1% of the span, VBW ≥ RBW

Sweep = auto, Detector function = peak, Trace = max hold

7.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2011

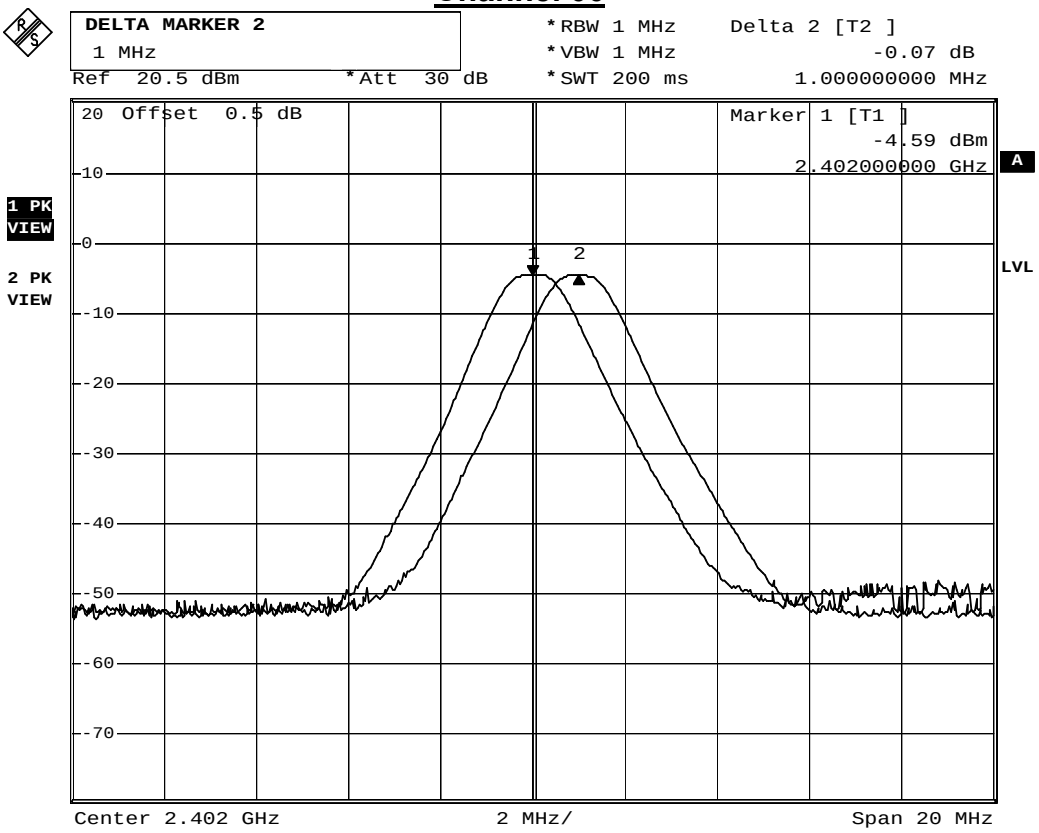
7.6. Test Result

Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
00	2402	1.000	≧745.800	Pass

Channel 00

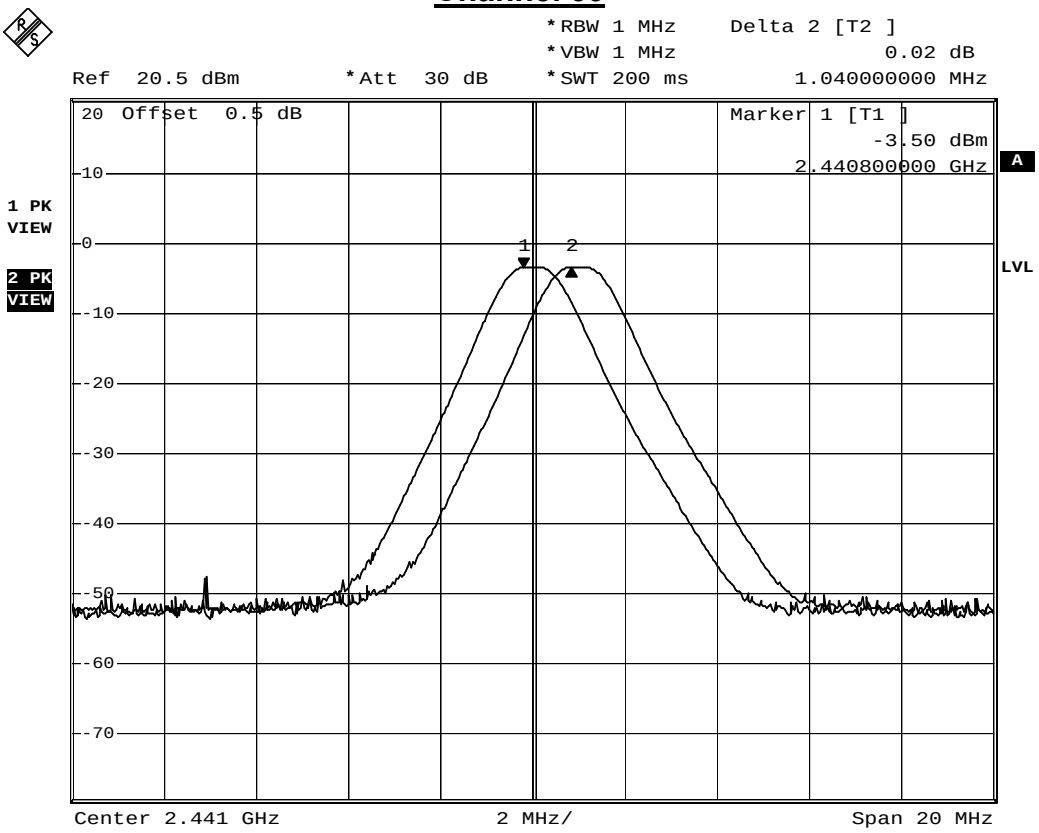


Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
39	2441	1.040	≧739.200	Pass

Channel 39

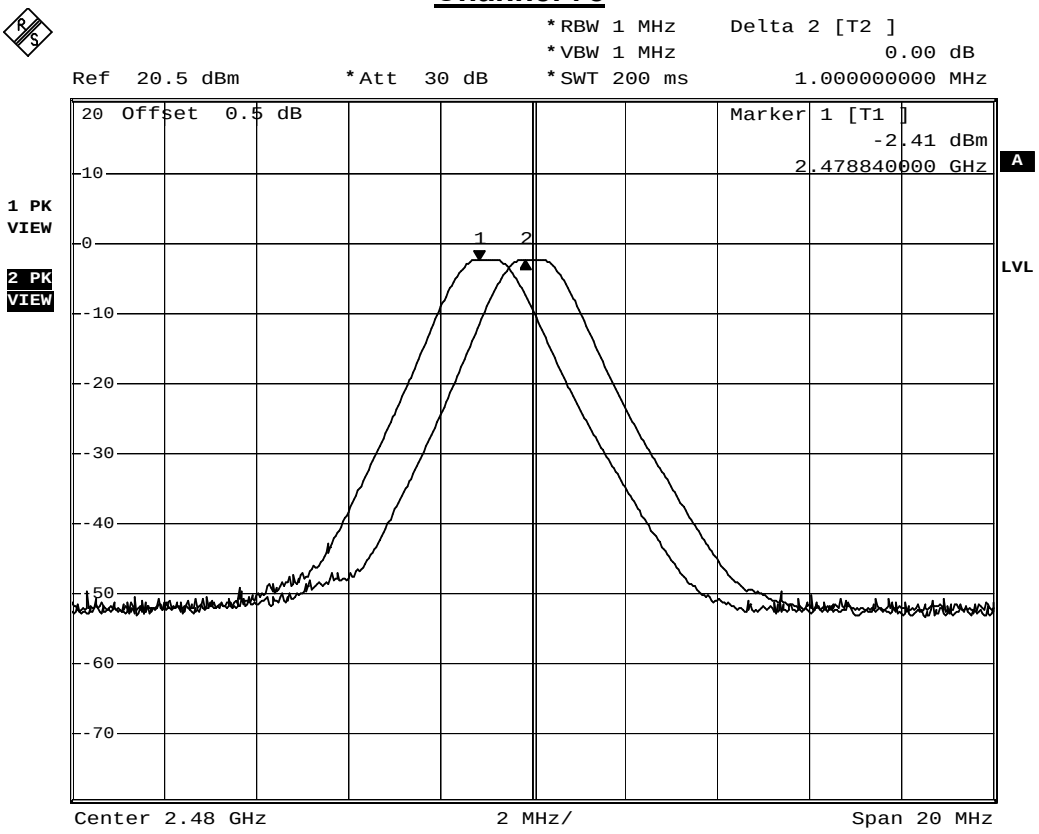


Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
78	2480	1.000	≧739.200	Pass

Channel 78



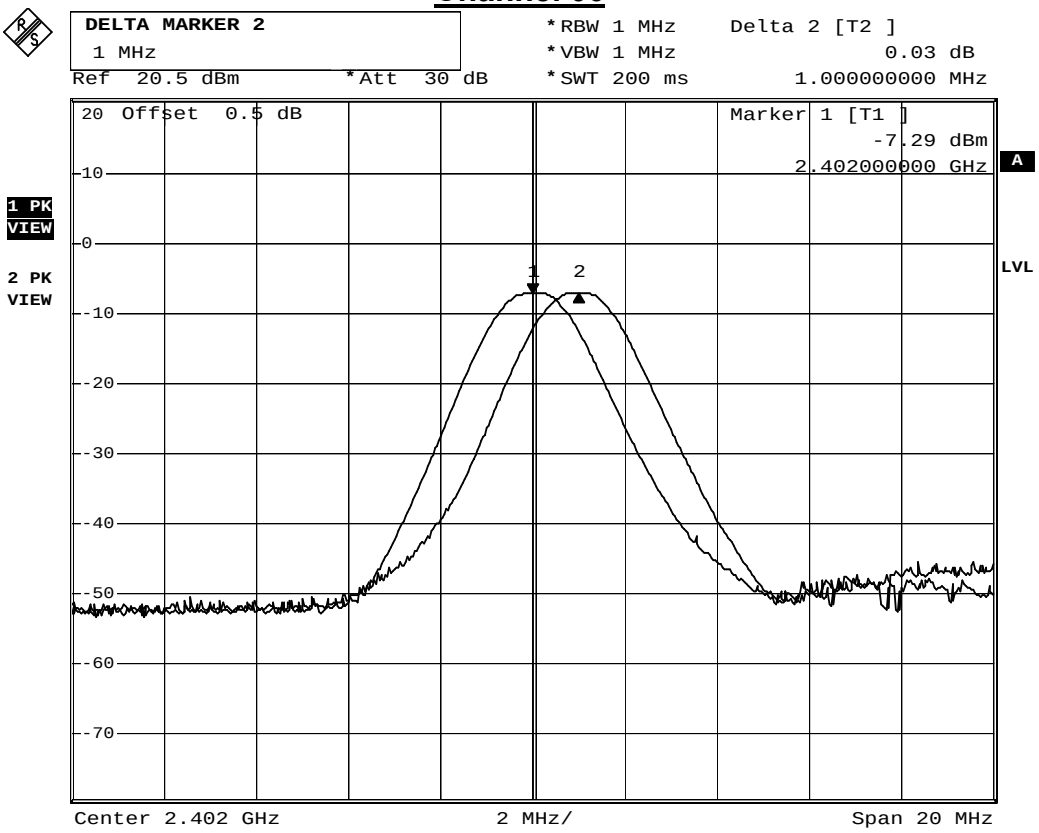
Date: 10.SEP.2012 16:20:48

Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
00	2402	1.000	≧917.400	Pass

Channel 00

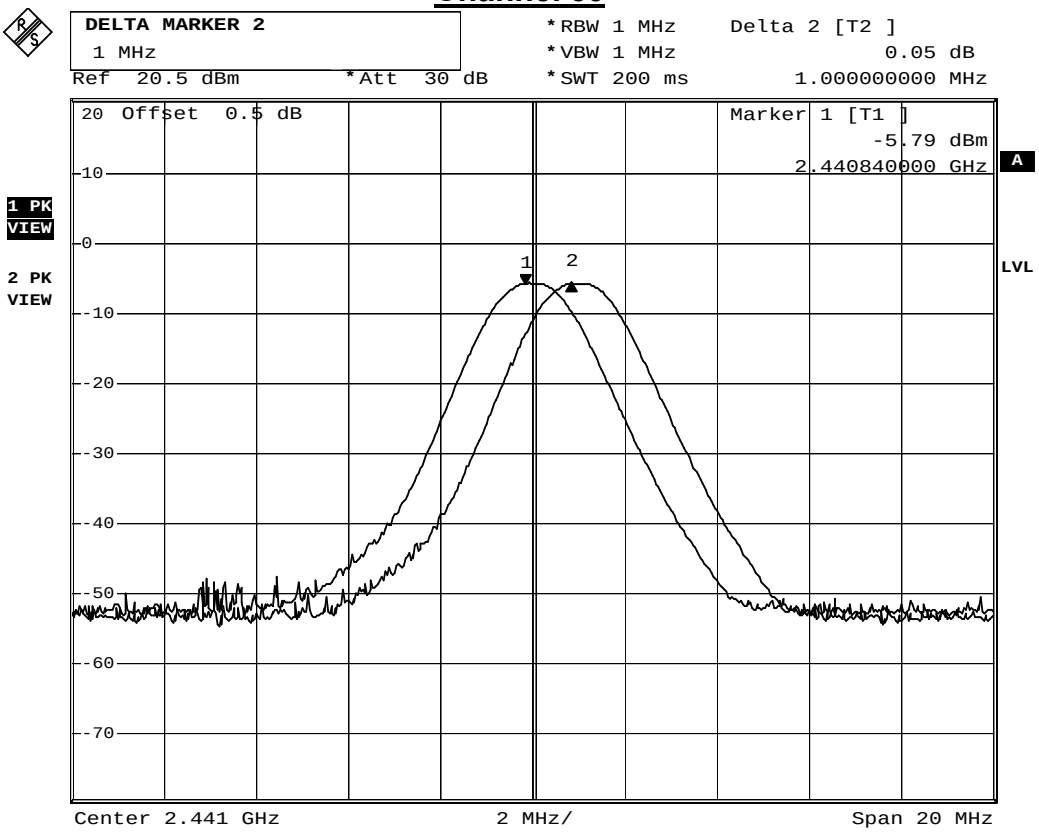


Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
00	2402	1.000	≧917.400	Pass

Channel 39

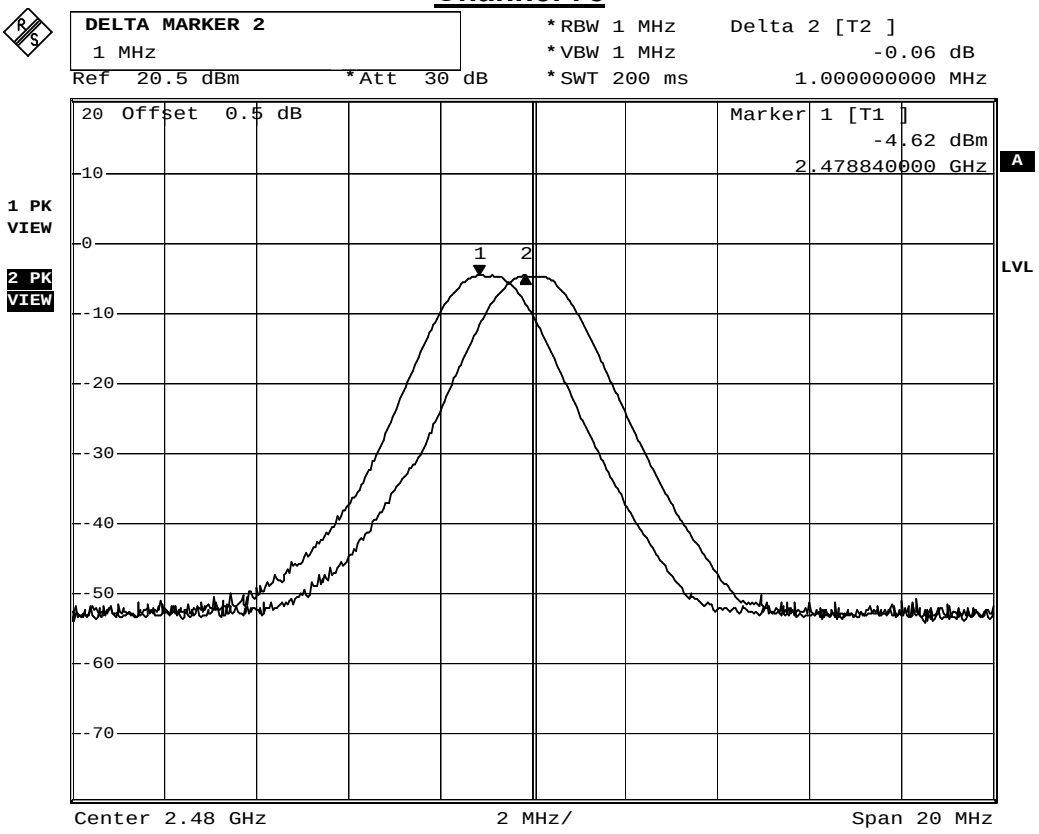


Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
78	2480	1.000	≧910.800	Pass

Channel 78



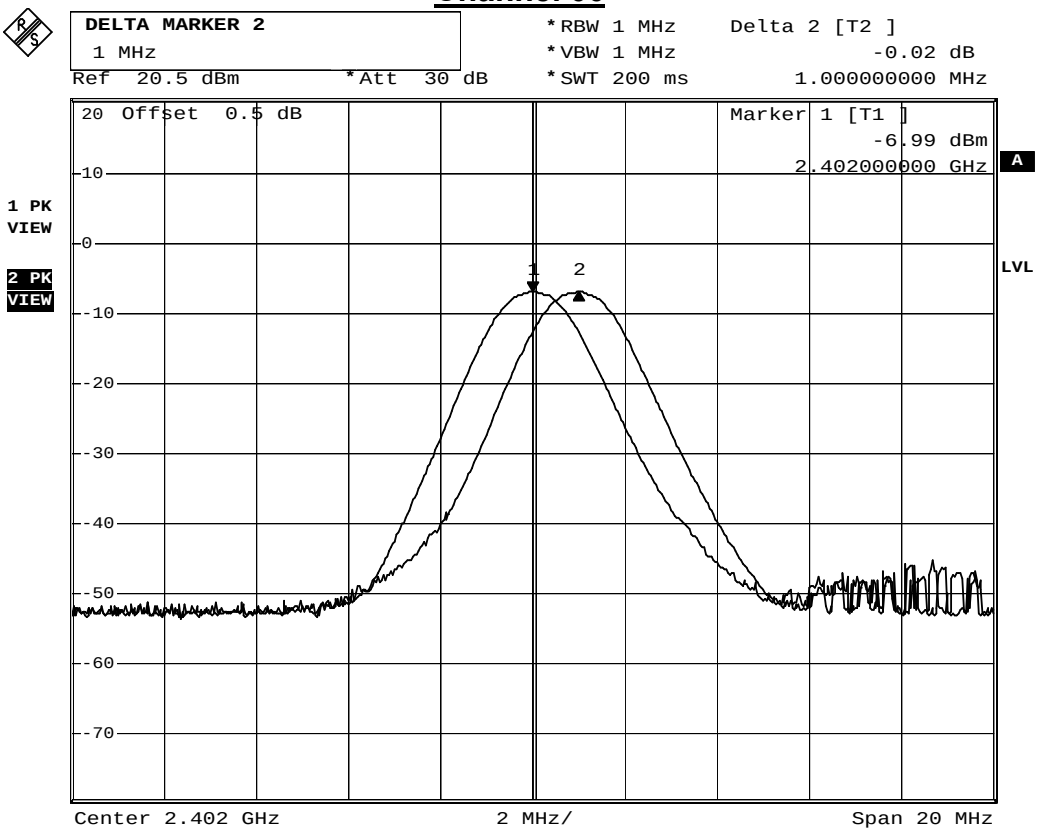
Date: 10.SEP.2012 15:57:26

Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
00	2402	1.000	≧917.400	Pass

Channel 00

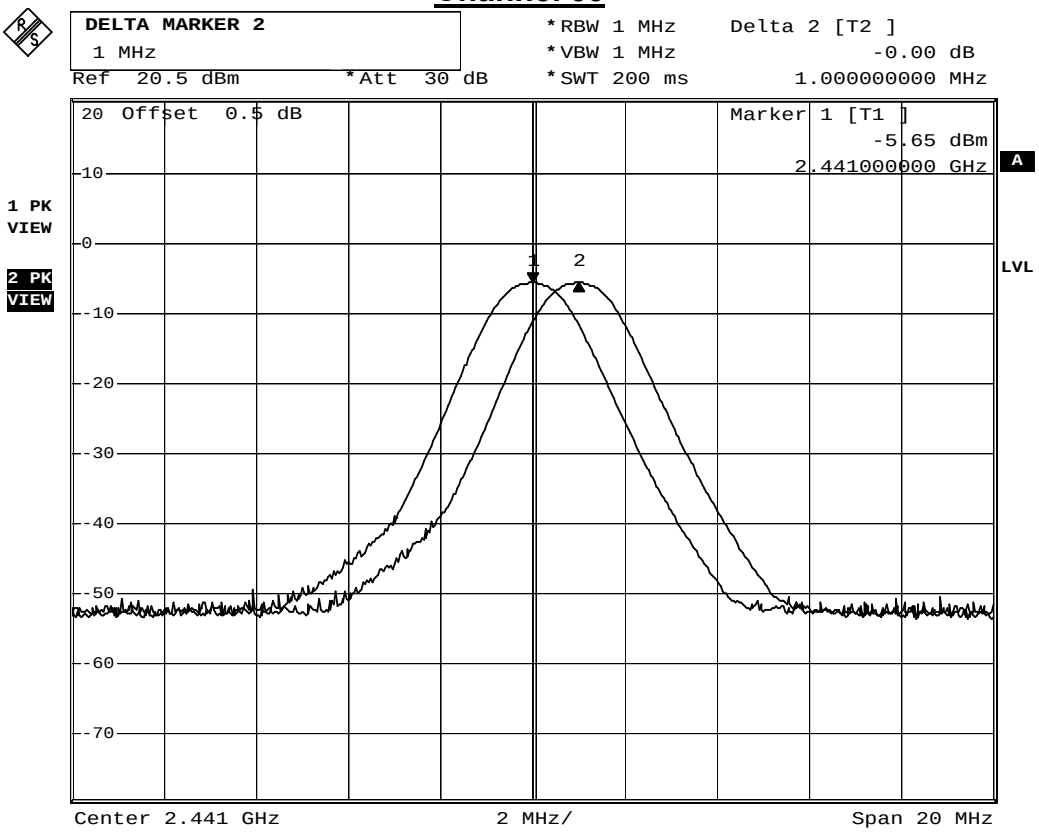


Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
39	2441	1.000	≧917.400	Pass

Channel 39

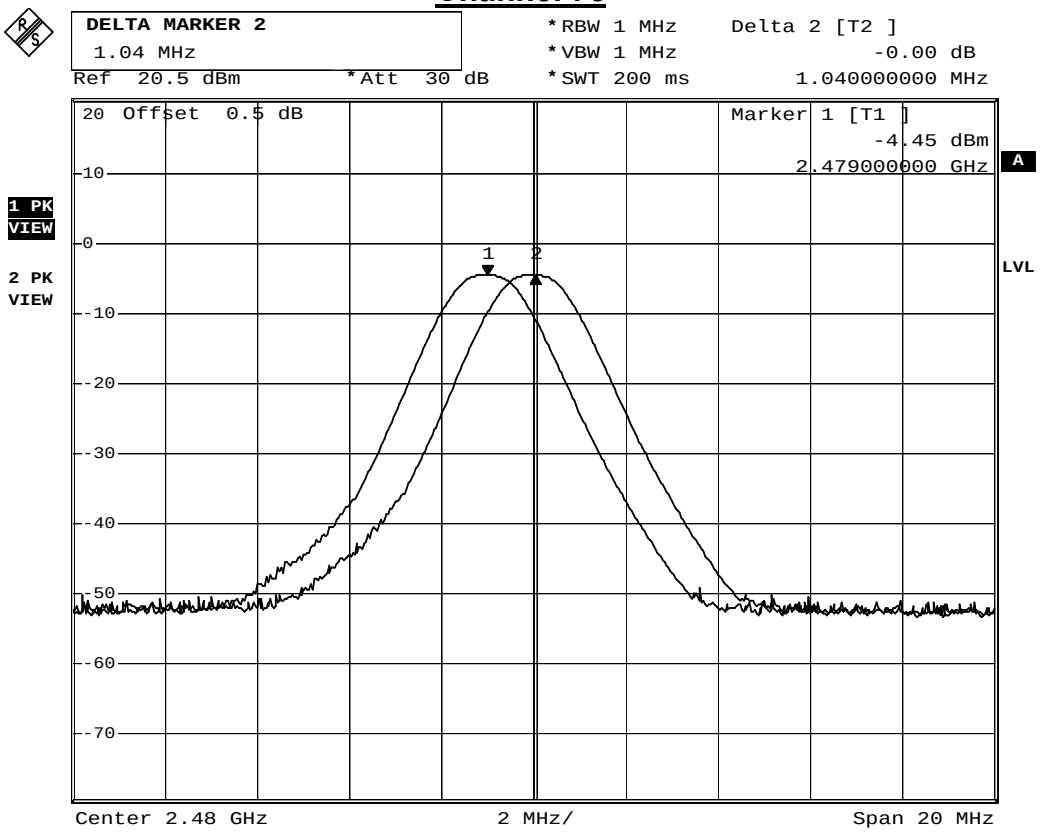


Product	Navigation system		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (kHz)	Result
78	2480	1.040	≧924.000	Pass

Channel 78



Date: 10.SEP.2012 15:55:09

8. Occupied Bandwidth

8.1. Test Equipment

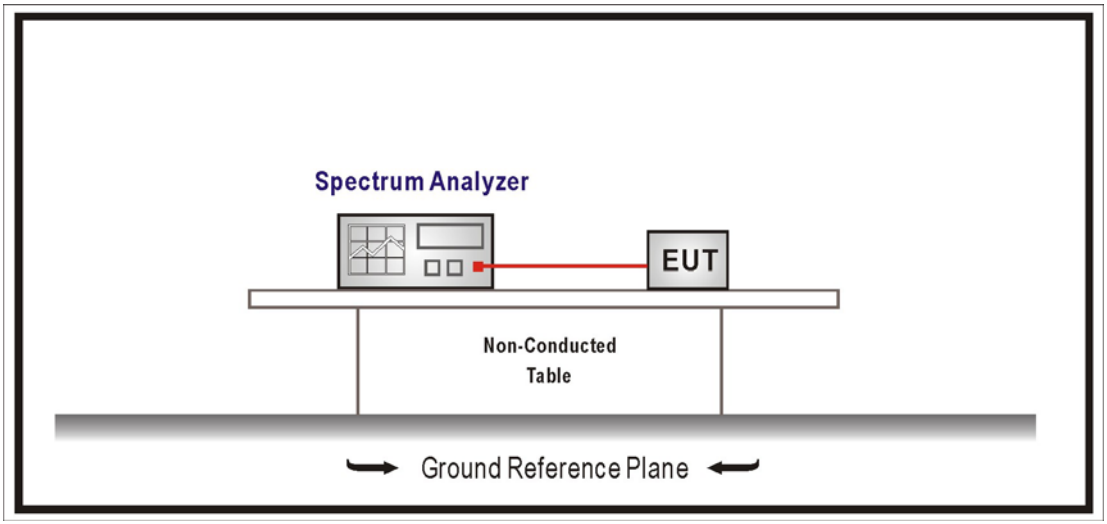
The following test equipment is used during the test:

Occupied Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

8.2. Test Setup



8.3. Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
For frequency hopping systems operating in the 5725-5850 MHz bands. The maximum 20 dB bandwidth of the hopping channel is 1 MHz.
For frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

8.4. Test Procedures

The EUT was setup according to ANSI C63.4, 2009 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements
Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ RBW
Sweep = auto, Detector function = peak, Trace = max hold
The EUT should be transmitting at its maximum data rate.

8.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2011

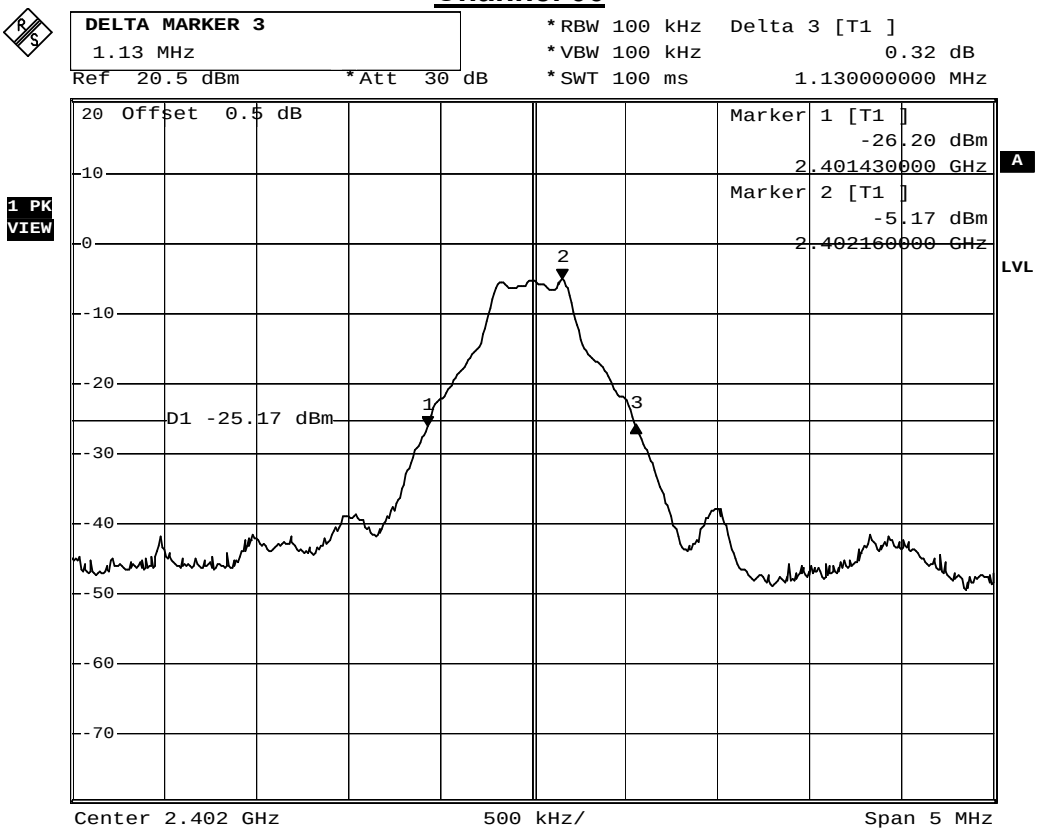
8.6. Test Result

Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
00	2402	1.130	--	Pass

Channel 00



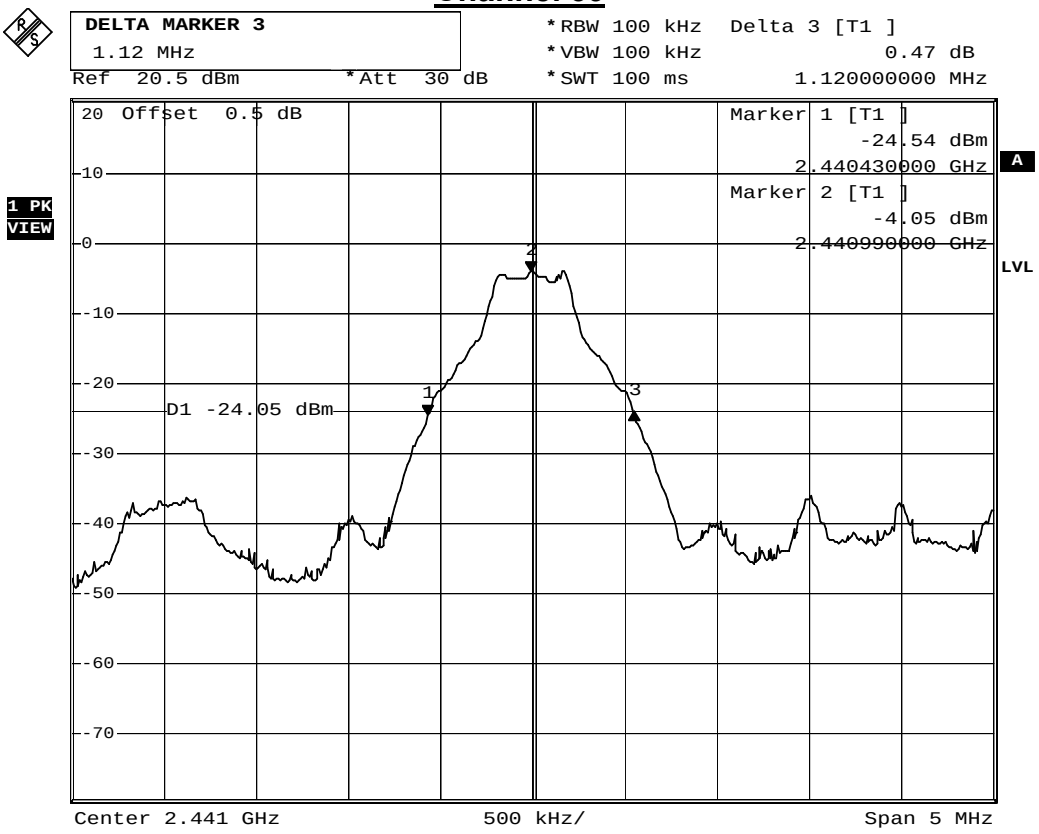
Date: 10.SEP.2012 15:11:56

Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
39	2441	1.120	--	Pass

Channel 39

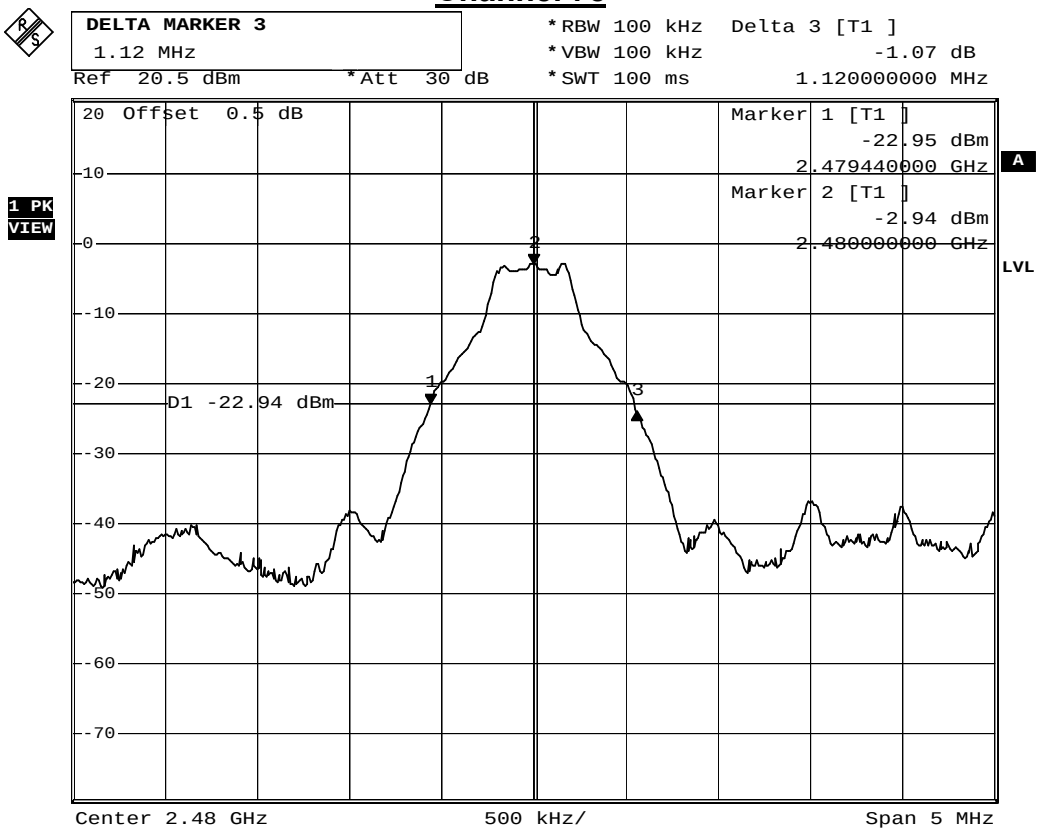


Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

GFSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
78	2480	1.120	--	Pass

Channel 78

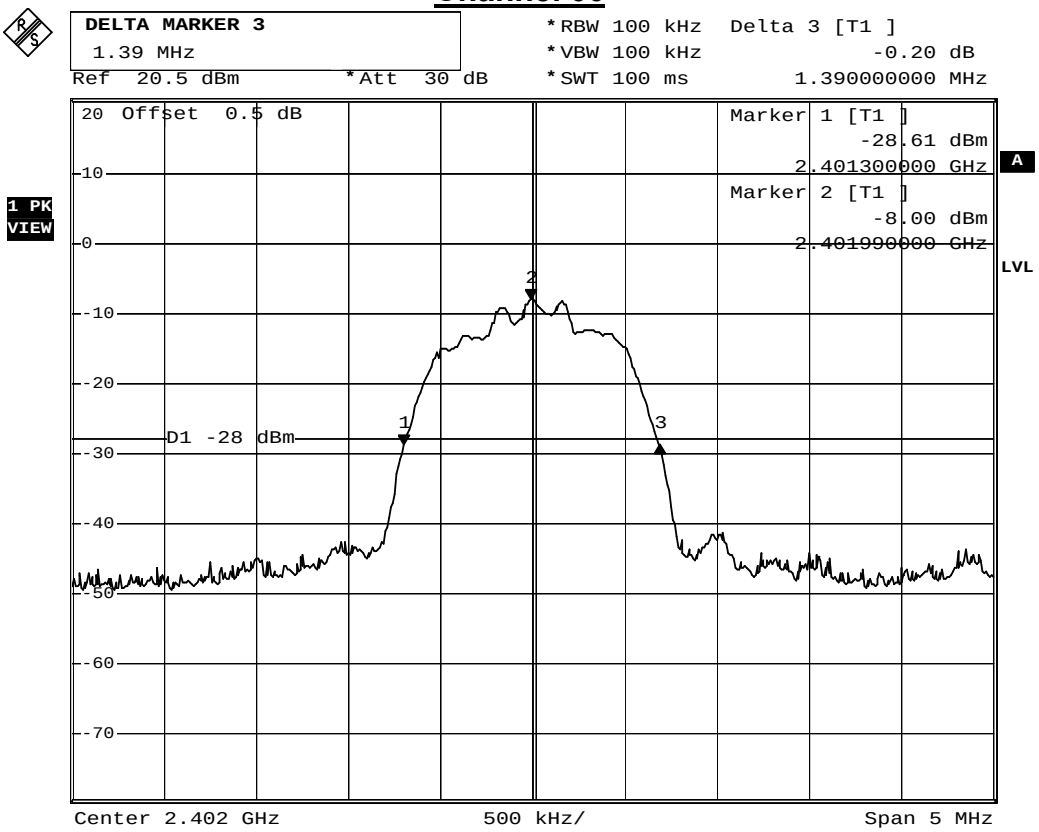


Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
00	2402	1.390	--	Pass

Channel 00



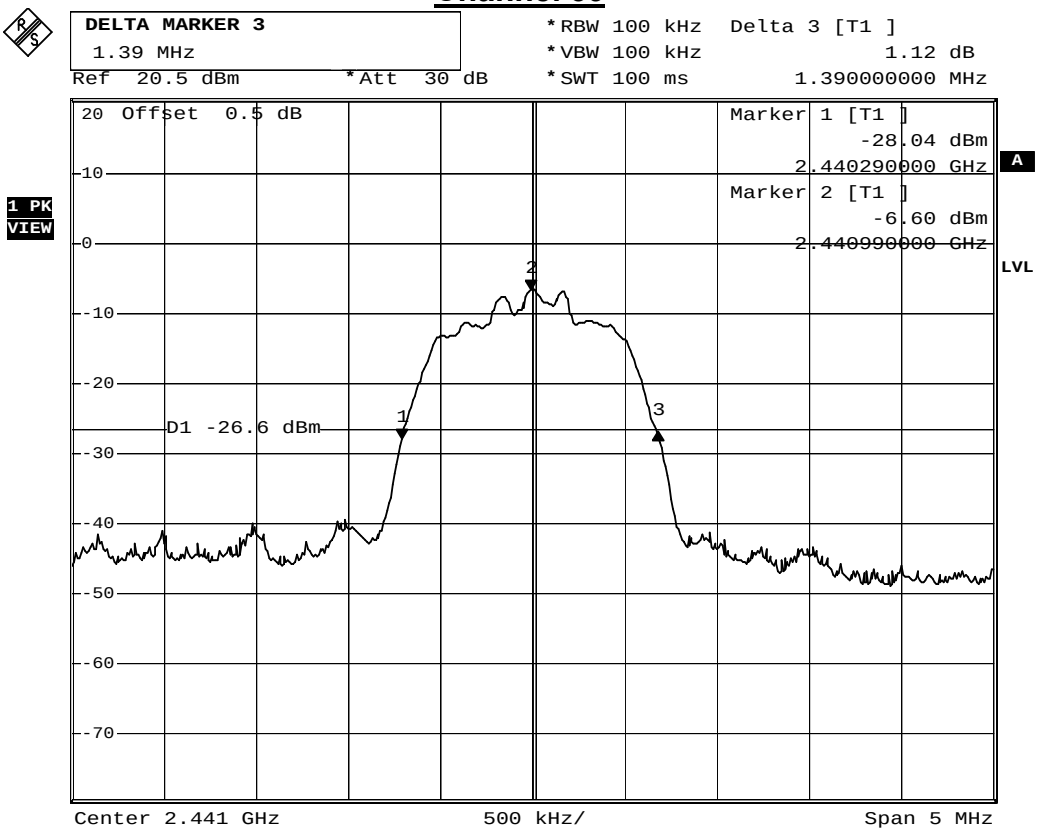
Date: 10.SEP.2012 15:31:41

Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
39	2441	1.390	--	Pass

Channel 39

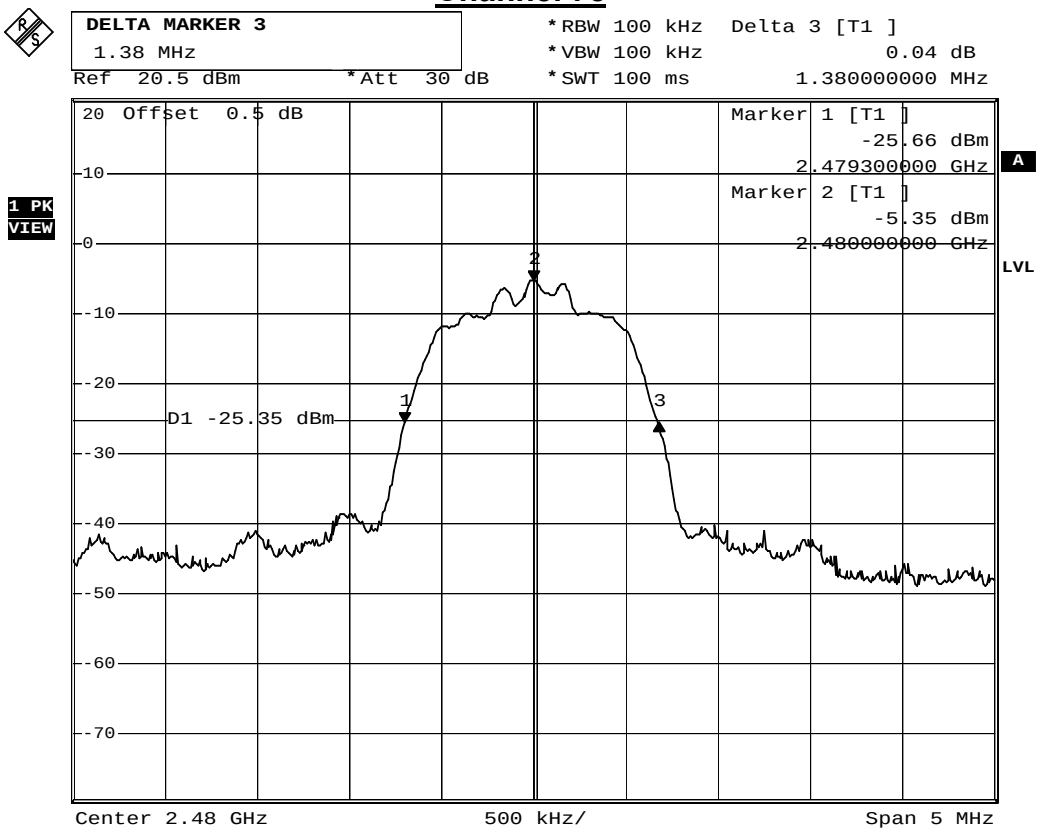


Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

π/4-DQPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
78	2480	1.380	--	Pass

Channel 78

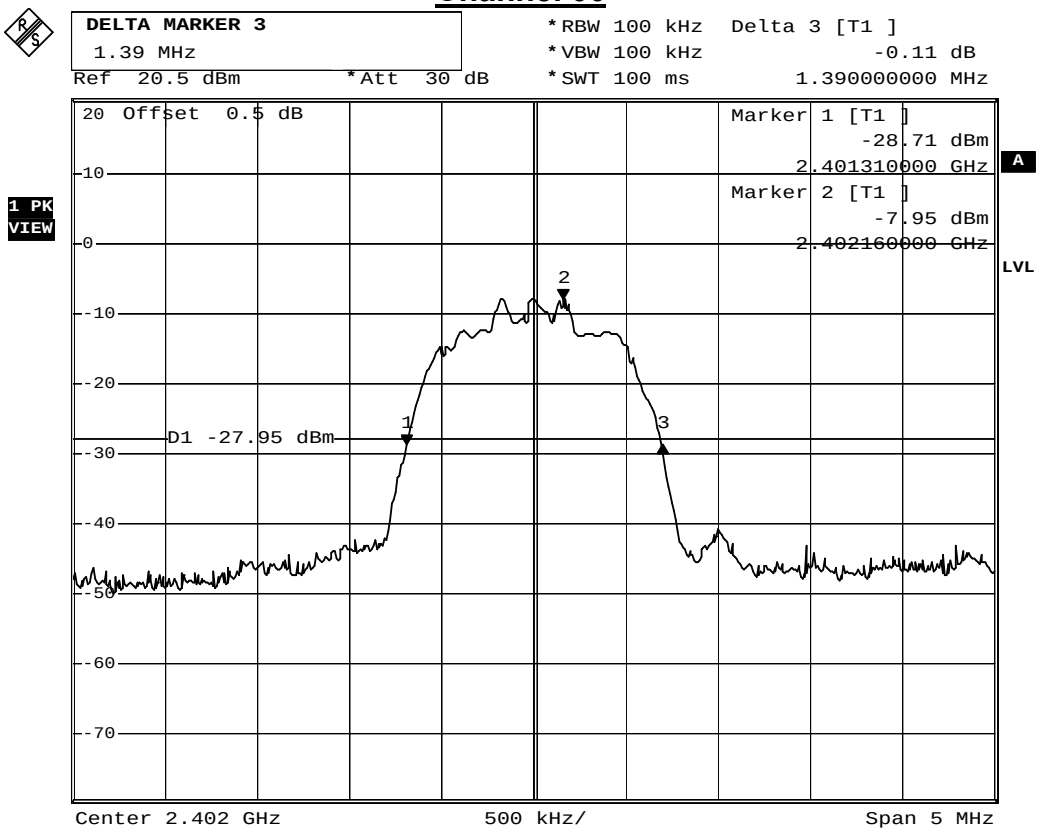


Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
00	2402	1.390	--	Pass

Channel 00

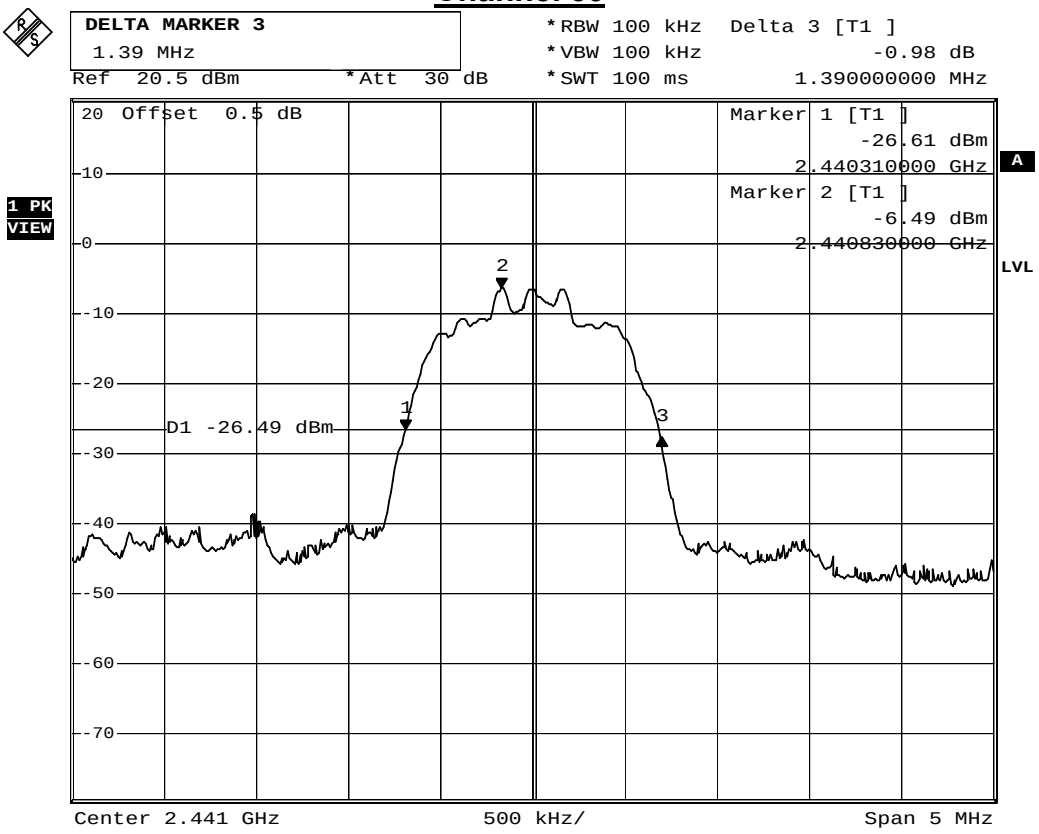


Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
39	2441	1.390	--	Pass

Channel 39

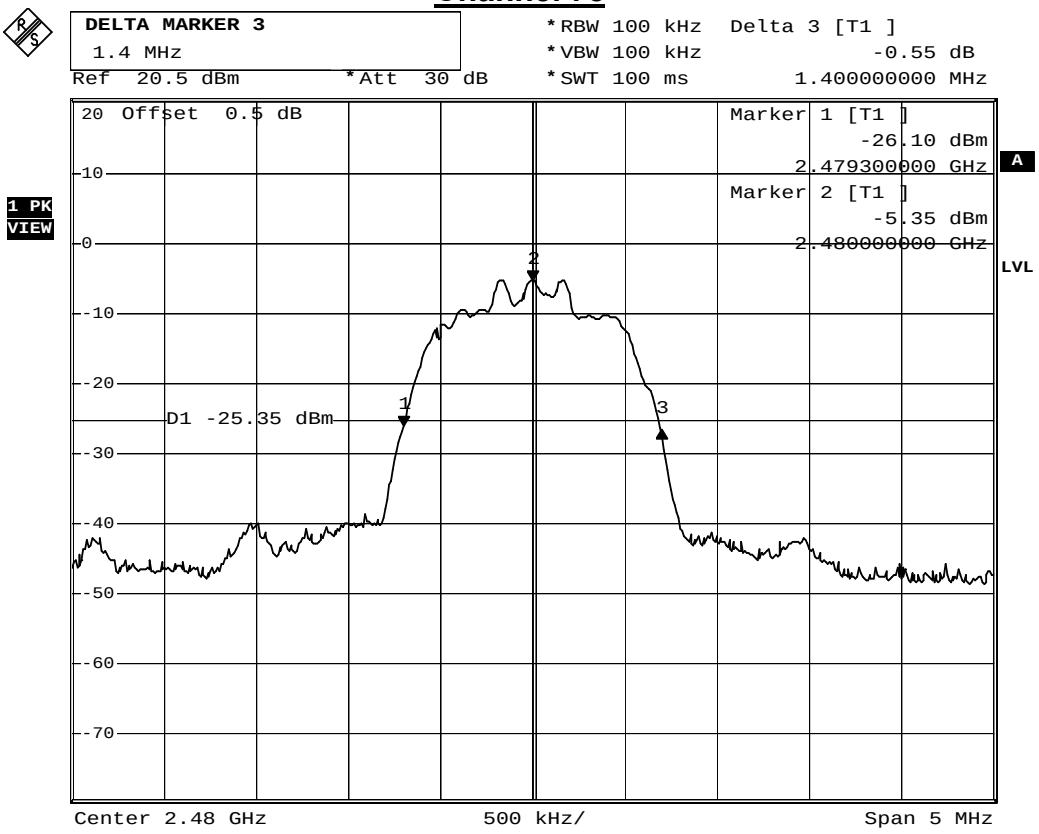


Product	Navigation system		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

8-DPSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
78	2480	1.400	--	Pass

Channel 78



9. Dwell Time

9.1. Test Equipment

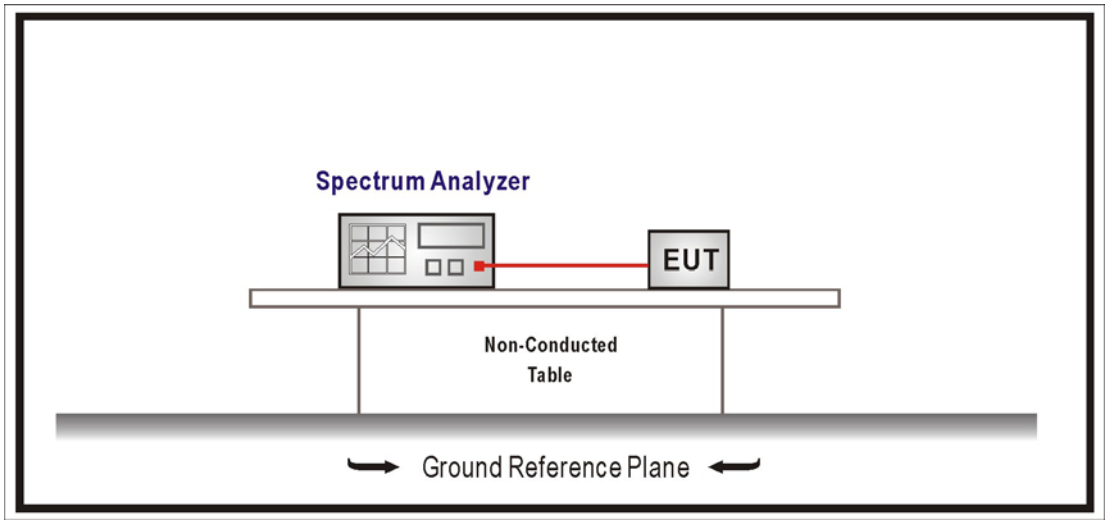
The following test equipment is used during the test:

Dwell Time / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSP	100561	2013/02/19

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

9.2. Test Setup



9.3. Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.
For frequency hopping systems operating in the 2400-2483.5 MHz bands. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
For frequency hopping systems operating in the 5725-5850 MHz bands. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

9.4. Test Procedures

The EUT was setup according to ANSI C63.4, 2009 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements
Span = zero span, centered on a hopping channel
RBW = 1 MHz, VBW ≥ RBW
Sweep = as necessary to capture the entire dwell time per hopping channel
Detector function = peak, Trace = max hold

9.5. Test Specification

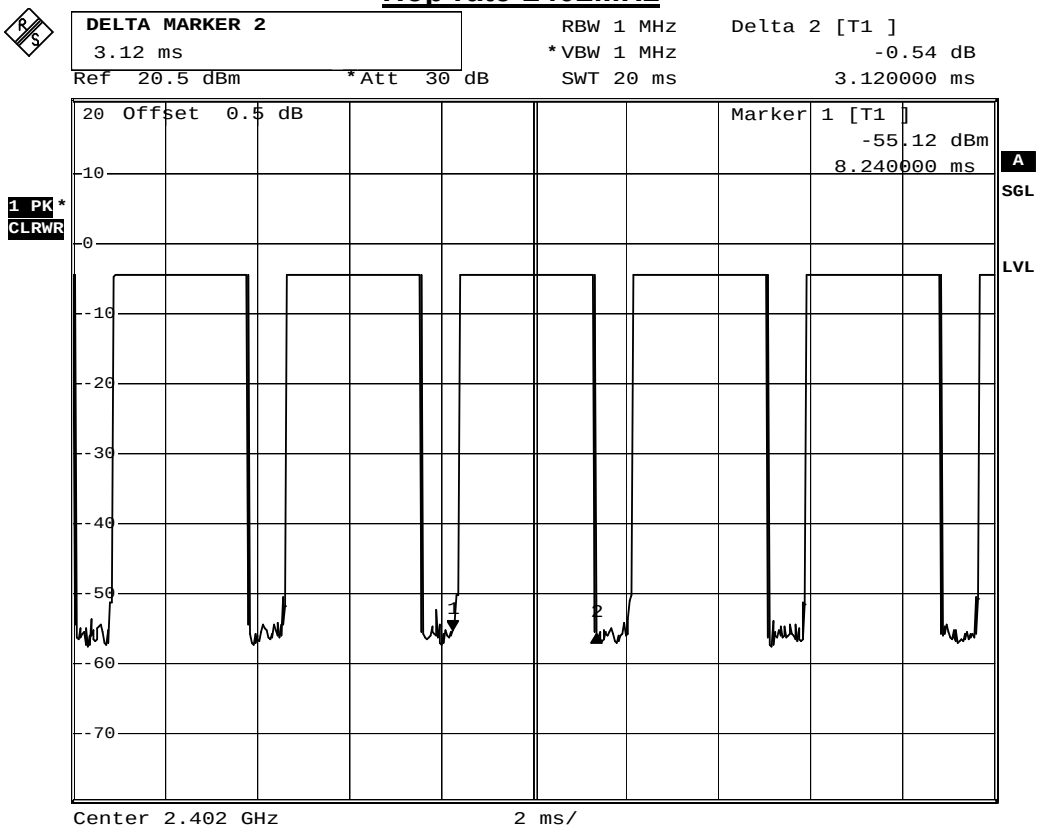
According to FCC Part 15 Subpart C Paragraph 15.247: 2011

9.6. Test Result

Product	Navigation system		
Test Item	Dwell Time		
Test Mode	Mode 1: Transmit		
Date of Test	2012/09/10	Test Site	SR7

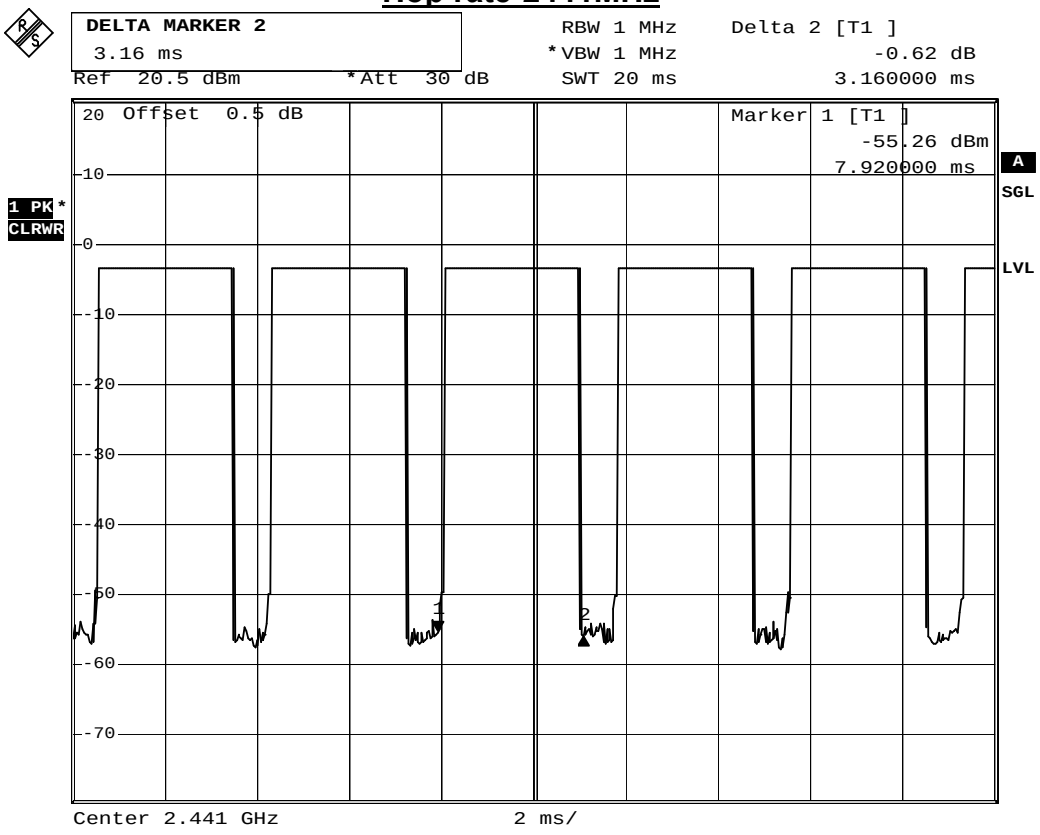
Channel No.	Frequency (MHz)	Measure Level (sec)	Limit (sec)
00	2402	Period = 0.4x79=31.6 Hop rate = 5/20=250 Time slot length=0.00312 Dwell Time=0.312	≦0.4
39	2441	Period = 0.4x79=31.6 Hop rate = 5/20=250 Time slot length=0.00316 Dwell Time=0.316	≦0.4
78	2480	Period = 0.4x79=31.6 Hop rate = 5/20=250 Time slot length=0.00312 Dwell Time=0.312	≦0.4

Hop rate-2402MHz



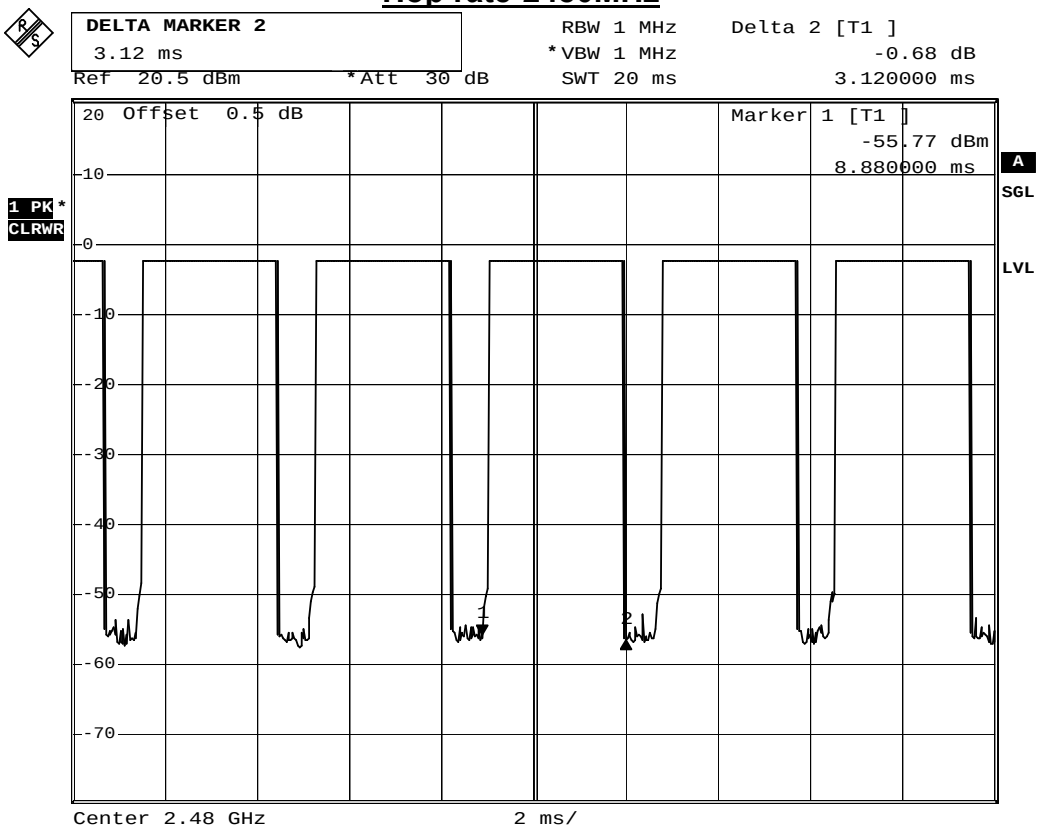
Date: 10.SEP.2012 17:10:09

Hop rate-2441MHz



Date: 10.SEP.2012 17:07:46

Hop rate-2480MHz



Note: Dwell time＝time slot length * hop rate / number of hopping channels * period